PROCEEDINGS
of the
ROYAL SOCIETY OF
MEDICINE

Section of Ophthalmology.

President—Mr. Elmore W. Brewerton, F.R.C.S.

Tay's "Guttate Choroiditis."

By Ernest Clarke, C.V.O., F.R.C.S.

THE first mention of this condition was by Jonathan Hutchinson in 1876, in the *Royal London Ophthalmic Hospital Reports*, viii, 231. The heading of the paper is: "Symmetrical Central Choroido-Retinal Disease in Senile Persons." Ten cases are cited, but there is no picture. In all, the guttate appearance of the choroid was associated either with marked changes in the choroid or retina, or with cataract. The ages ranged from 38 to 74, and vision was poor in all.

Hutchinson thought that the condition was a form of what he called "senile amaurosis." He gives Warren Tay the credit for discovering this peculiar form of *spotty choroid*. In reading through the description of these ten cases there is nothing to controvert the theory that, anyhow, in some of them, this spotty appearance was *an accidental association*.

(1) The first typical case reported was by Nettleship in 1884, *Trans. Ophth. Soc.*, vol. iv, 164, and was accompanied by a picture which I show now. Both the description and the picture tally somewhat with what we understand as Tay's "guttate choroiditis," but Nettleship does not mention Tay, nor does he give any suggestion as to the probable cause of the condition. He simply states that there was no choroidal disease elsewhere, and that vision was normal. Note that the spots are more or less *defined*.

(2) In 1892 Mr. Henry Juler reported a much more typical case, *Trans. Ophth. Soc.*, xiii, 143. Here, again, the condition is not labelled as Tay's, but the author makes the significant remark, "I consider this a variation of the normal choroid, and not due to any plastic exudation in the choroid." In the illustration which I show the spots are seen to be faint and *not* defined.

Three years ago, at the meeting of the Ophthalmological Society, Mr. R. C. Davenport opened a discussion on Tay's choroiditis and allied conditions (*Trans. Ophthal. Soc.*, 1929, xlix, 110) and he rightly drew attention to the loose way Tay's "guttate choroiditis" has been mixed up with other changes in the choroid.

He suggests a classification of cases allied to Tay's "guttate choroiditis" as follows:—

(i) Colloid body formation.
    (*a*) Juvenile or possibly congenital.
    (*b*) Senile or at least first seen in old people.
    (*c*) Associated with gross fundus changes.
(ii) Conditions simulating colloid body formation in the clinical picture.

He concludes by saying he would keep the name of Tay only for (i) *with unimpaired vision*.

One fact I think is quite clear, that typical Tay's guttate choroiditis is always associated with *normal*—and even *supernormal*—vision and for this reason a genuine case has never yet been examined by a pathologist. Cases that have been reported in which there were hyaline or colloid bodies, sometimes pushing into the retina and damaging the rods and cones, should not be labelled Tay's. Neither would I class Doyne's cases of familial guttate choroiditis as Tay's.

I go a little further than Mr. Davenport. Mr. Henry Juler said he thought the condition was a variation of the normal choroid, and I agree with him and suggest that it is probably always congenital, and possibly due to some error in development. This opinion has been specially forced on me lately by a case, a picture of which I show you now. (See Plate.)

(3) A lady who looked 28, but was ten years older, was sent to me to have her refraction examined, with a view to ascertain whether the migraine from which she suffered was due to eyestrain. Vision, with correction, was $\frac{6}{5}$ in both eyes; under homatropine I found a small amount of myopia with astigmatism and slight anisometropia, and the correction in a short time removed the migraine, from which she had suffered for years, and the cure of which she described as a miracle.

On examining the fundi with the ophthalmoscope I found, to my surprise, in the right eye, spots, yellowish-pink in colour, scattered all over the fundus; at the periphery some were very large and all were ill-defined. The macula had not escaped but the spots here were much smaller.

Now it is interesting to note that the left eye gave a picture of a typical Tay's choroiditis, like No. 7; the spots were very faint and small.

In the typical cases that I have watched for years I have always found the condition stationary, vision remaining good.

(4) Is a case of Sir William Lister's, the condition resembling my case No. 3, but the large spots more irregular. In this case also vision was normal.

(5) Is a similar case of Mr. Cardell's, in a patient aged 49, the vision in both eyes was $\frac{6}{5}$. The spots were ill-defined, but very numerous.

(6) Is a case of mine watched for twenty-five years. Vision $= \frac{6}{5}$, with correction in both eyes.

(7) Is a typical picture and resembles Juler's (No. 2).

But for the habit we all have of examining every eye with the ophthalmoscope, these cases could be easily missed; in fact, unless the eye is examined by the direct method, probably many have been missed.

This condition was probably discovered by Tay because he was such a careful examiner, and always used the *direct* method with the ophthalmoscope. I was his clinical assistant at the time at the old Moorfields Hospital; (I am speaking of fifty years ago). Many observers were still using indirect ophthalmoscopy; indeed the late Dr. Batten informed me that Sir William Gowers invariably used it for his illustrations for his book on " Medical Ophthalmoscopy."

Who began calling this fundus picture " guttate choroiditis "? The name appears to have come about gradually.

I feel strongly that we ought to keep Tay's name associated solely with the typical form to which I have referred, and not with every spotty state of the choroid.

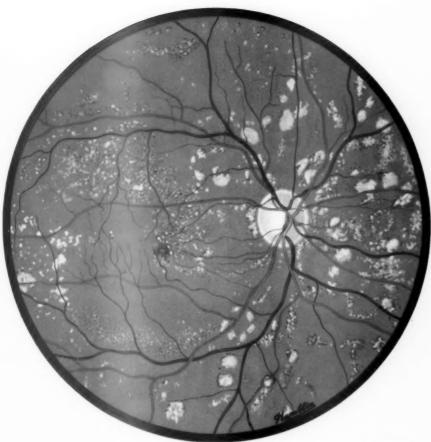It would be interesting to know if there is any developmental condition which might cause these spots.

Of one thing we can be sure, it is *not* a choroiditis; if we intend to retain the name " guttate choroiditis," it should be placed in inverted commas.
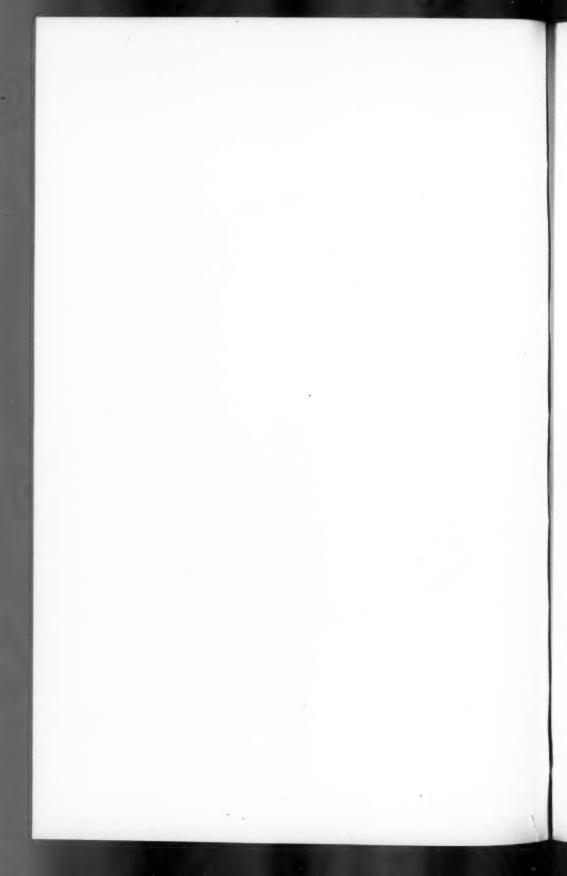
Rare form of Tay's " Guttate Choroiditis."

Note that the spots are all ill-defined, are not raised, and, especially at the periphery,
are of an unusual size.

Section for the Study of Disease in Children.

President—Sir HENRY GAUVAIN, M.D.

Congenital Morbus Cordis. Transposition of the Aorta and Patent Interventricular Septum. K. H. TALLERMAN, M.D.

D. L., a girl, aged 7 years, was brought to the London Hospital on May 11, 1932, on account of cyanosis and shortness of breath. Nothing abnormal is said to have been noticed at birth, but at a few months of age, cyanosis—which was worse when the child cried—is said to have been marked, and since this time has been continually present, with dyspnœa on walking. There has never been any complaint of rheumatic pains, and there is no history of repeated sore throat. With the exception of measles at five years of age, there have been no definite illnesses. The appetite is variable ; she is a restless and poor sleeper, and is generally fidgety.

Family history.—Patient is an only child, her mother having married late in life. Her father is said to suffer from asthma and "heart trouble," and one uncle is known to be suffering from syphilitic aortitis and angina pectoris.

On examination.—Nutrition generally good ; cyanosis extremely marked ; severe clubbing of fingers (see fig.), and, to a lesser extent, of toes.

Dr. Tallerman's case of congenital morbus cordis.

Cardio-vascular system.—Heart not enlarged ; apex beat in fourth space, just internal to nipple line. Pulsation also felt to right of sternum. No thrills felt. No murmurs detected. Aortic second sound + ; pulmonary second sound not accentuated. Slight tachycardia, probably due to nervousness. Blood-pressure (somewhat difficult to measure) 95/80 in each brachial artery, 115/80 in femoral artery.

OCT.—CHILD. 1

Other systems.—No abnormalities detected. Liver normally placed on right side.

Blood-count (24.5.32).—R.B.C. 9,200,000 ; Hb. 120 ; C.I. 0·7 ; W.B.C. 9,400. *Differential count.*—Polys. 59% ; eosinos. 1·5% ; small lymphos. 28·0% ; large lymphos. 8·0% ; large hyals. 3·5%.

Special investigations carried out in the Cardiac Department.—(For these I am indebted to Dr. William Evans) :—

Electrocardiogram.—Sinus rhythm. Ventricular rate, 110, Right ventricular preponderance. ~~Inverted in lead III.~~ " *T inverted in lead III* "

Orthodiagram and teleradiogram.—Some generalized enlargement of the heart. Enlargement of left ventricle, which shows a rounded left border. Some enlargement of right auricle, and probably of conus of right ventricle. Pulmonary arc not identified. Aortic knuckle absent on left side ; ascending aorta is prominent to the right. The barium-filled œsophagus is placed to left of aortic arch. Left auricle in Oblique 1 position shows no obvious enlargement, and the retro-cardiac space is clear, apart from slight opacity in region of hilum of lung.

The intense cyanosis and clubbing, together with the position of the aorta, indicate transposition of this vessel, which is probably arising from the right ventricle ; in addition, the enlargement of the left ventricle suggests patent interventricular septum, while the absence of the pulmonary arc would appear to rule out a patent ductus arteriosus. The absence of all classical physical signs in the cardiac area is evidence against congenital pulmonary stenosis, but nevertheless an atresia of this vessel may exist, and this is supported by the absence of the pulmonary arc in the teleradiogram. In this event the case would fall into the category of Fallot's tetrology.

Lipodystrophia Progressiva.—E. A. COCKAYNE, D.M., F.R.C.P.

R. H., aged 7 years 5 months. No other case is known to have occurred in the family ; the parents are healthy and not blood relations. She has one brother, aged 15, and two sisters, aged 11 years and 6 months and 2 years and 9 months respectively, all normal. She has never been fat, but her cheeks used to be plump. The thinness of the face was first noticed in December, 1931, and she was taken to a tuberculosis dispensary on account of it, but her mother was told that the child was not tuberculous. Since then the face has gradually become thinner. The onset did not follow any illness. There is now complete loss of the subcutaneous fat of the face, but very little loss of that of the arms and trunk. Her general health has not been affected in any way.

Dr. F. PARKES WEBER suggested that, as basophilic *hyperpituitarism* (according to Cushing's recent work on basophilic adenomata of the pituitary body) was accompanied by excessive development of subcutaneous fat in the face and trunk (whilst the legs might be thin), it was just conceivable that in "lipodystrophia" the disappearance of subcutaneous fat from the face and often also from the trunk (whilst the legs and gluteal regions sometimes became unusually fat) might be due to a condition of basophilic *hypopituitarism* (see F. P. Weber, *Brit. Med. Journ.*, 1932, i, 935).

Trigeminal Nævus and Hæmangioma of Meninges. — R. W. B. ELLIS, M.D. (by permission of Dr. K. H. TALLERMAN).

C. J., male, aged 1 year and 9 months. Both parents and three other children alive and well. Breast-fed nine months. Delivery and development normal ; walked at one year. No abnormality except presence of right-sided nævus of face and forehead noted until age of 11 months (June, 1931), when repeated left-sided convulsions (without loss of consciousness) occurred, and patient was admitted to hospital for ten days. A second series of convulsions occurred in August and a third in November, 1931, when patient was again admitted to hospital. On return home,

the left arm was found to be contracted in full flexion, and use of it was only gradually regained.   In March, 1932 the convulsions recurred, affecting at first the left leg only, subsequently the left arm and leg, and have continued with variable frequency and severity up to the present time.   Recently there have been associated clonic movements of the right arm.

Seen at London Hospital, April 24, 1932.   Attack observed during examination. Patient whilst sitting quietly suddenly cried out, and the left arm and leg became spastic in extension, the hand clenched, and the foot in the position of " pedal spasm."   The head was retracted ; there appeared to be no loss of consciousness.

C. J., showing right trigeminal nævus.

The right leg was of normal tone.   Clonic movements occurred in the right!arm for several seconds, but the child continued to hold a toy with which he was playing, and the right arm and hand were used normally immediately afterwards.   The spasticity of the left arm and leg lasted approximately forty seconds and was followed by some slight degree of weakness and ataxia lasting about half an hour.
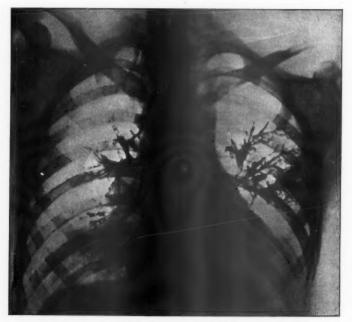
On examination.—Well-developed male infant, reacting normally for his age.   An extensive pinkish-red nævus is present on the right side of the face and forehead in approximately the distribution of the ophthalmic division of the fifth nerve, and extending far back on the scalp.   There is no demonstrable weakness or ataxia of the

limbs.   Knee- and triceps-jerks brisk and equal.   Abdominal reflexes present on the right, absent on the left.   Right plantar reflex flexor, left equivocal.   Pupils and eye movements normal ; no buphthalmos.   Fundi, discs and visual fields normal.

Skiagram of skull (stereoscopic).—" No extra calcification seen."

Atelectatic Bronchiectasis and Displacement of Heart.—R. W. B. ELLIS, M.D. (by permission of Dr. A. G. MAITLAND-JONES).

C. F., male, aged 13 years, an only child, was well until he had pneumonia following measles at $4\frac{1}{2}$ years of age, since when he has had persistent cough. Cough occurs throughout the day and is not usually productive.   Patient was seen at London Hospital on account of this symptom when 7 years old.   At that time he

Bronchiectasis, within collapsed area behind heart shadow

showed impaired percussion note with crepitations and occasional rhonchi at left base, but normal air-entry ; the apex beat was 1 in. to the left of the mid-clavicular line.   No cardiac murmur present.   X-ray examination showed increase of lung markings at right base, left base being obscured by heart shadow.   Physical signs and symptoms have persisted since this, though general health has been good. Slight degree of clubbing noted for past four years.   Tonsillectomy performed 3.6.27.

26.2.32.   X-ray report (Dr. Rae).—" Diaphragmatic movements fair but equal. Heavy hilum shadows with increase of lung markings at right base.   There is a well-defined shadow in behind the shadow of the heart, having the appearance of a collapsed lobe."

14.4.32.—Lipiodol injection carried out by the cricothyroid route and patient was turned on left side with head raised.   The lipiodol failed to enter the left base

though the right lung filled normally. The injection was followed by considerable constitutional disturbance, with rise of temperature and vomiting. For three days there was dullness with diminished air-entry at the right apex, but these signs cleared rapidly and the patient was discharged free from symptoms.

On May 1 (that is two weeks and a half after the lipiodol injection) vomiting recurred, with œdema of face and subsequently pitting œdema of legs and ankles. There was no complaint of frequency, dysuria, or headache, but when patient was seen on May 17 the urine contained a heavy cloud of albumin, macroscopic blood, many leucocytes, and hyaline and granular casts. The blood-pressure was 160/95. Since this time the œdema of face and ankles has disappeared, the blood-pressure has gradually fallen to normal, and the hæmaturia has decreased in amount.

On examination.—A well-developed and nourished pubescent boy; no dyspnœa, slight enlargement of thyroid. Early clubbing of fingers. Blood-pressure 115/65. *Chest*: slight flattening of left side but no demonstrable inequality of movement or scoliosis. Percussion note slightly diminished left base, with occasional rhonchi in this area. There is a small area of bronchial breathing below the angle of the left scapula. *Heart*: A.C.D., third rib above, left sternal border, left anterior axillary line. Apex beat in sixth space. There is a short localized systolic murmur in the mitral area, uninfluenced by posture. *Abdomen*: Liver edge palpable at costal margin, spleen and kidneys not felt. *Discs*: Normal.

Blood-urea 0·036%; normal reactions to renal function tests.

Orthodiagraphic Examination (*Dr. William Evans*). A slight thoracic scoliosis to the right. The heart appears to be displaced to the left; correction of the scoliosis by rotating the patient slightly to the right only partially minimizes the heart displacement. Heart not enlarged. Left ventricle and right auricle apparently not enlarged. Pulmonary arc full. Retro-cardiac space in the right oblique position is clear and although the barium stream deviates slightly to the right in the region of the left auricle the latter chamber does not appear to be enlarged. A subsequent lipiodol injection showed bronchiectasis within the collapsed area behind the heart shadow.

The orthodiagraphic examination, therefore, points to displacement of the heart to the left and reveals no obvious abnormality of the heart chambers.

Icterus Neonatorum: Congenital Obliteration of Bile Ducts: Specimen.—T. SKENE KEITH, M.B. (Shown for Dr. RONALD CARTER.)

Child, aged 5 months. Healthy at birth, jaundice noticed on second day.

The specimen shows a cirrhotic and jaundiced liver and fibrous remains of bile ducts and gall-bladder.

The post-mortem findings were as follows: Deeply jaundiced organs (except the liver) which was apparently normal, but slightly enlarged, very hard, and olive-green in colour. The gall-bladder was represented by a fibrous sack, devoid of mucous lining; it was not in connection with the bile ducts. The cystic, hepatic, and common bile ducts were represented by strands of fibrous tissue not definitely marked off from the surrounding areolar tissue.

The ampulla of Vater was well marked, and a bristle could be passed down it and into the pancreas, but not towards the liver. An abnormal branch of the hepatic artery lies slightly anterior to the track of the ducts.

On microscopic examination the liver showed advanced biliary cirrhosis. The bile ducts did not appear to be anywhere dilated; many regenerating masses of bile duct cells are seen. In the substance of the liver were a number of bile-stained amorphous deposits. The section of the pancreas appears to be normal.

Congenital Malformation of Heart: Specimen.—T. SKENE KEITH, M.B. (Shown for Dr. RONALD CARTER.)

The heart is that of a full-term child, who lived for eight hours. The aorta arises from the right ventricle, the vena cava opens into the right auricle. The pulmonary artery arises from the left ventricle and the pulmonary veins open into the left auricle. No septal defect; foramen ovale and ductus arteriosus normal. The left ventricle and the pulmonary artery are partly obstructed by clot.

Abdominal Fœtal Implantation: Retro Peritoneal Teratoma.—REGINALD LIGHTWOOD, M.D. (by permission of O. L. ADDISON, F.R.C.S.).

Female infant, aged 9 weeks, the only living child of healthy parents; one miscarriage.

History.—Enlargement of abdomen noticed from birth and is increasing. Bowels constipated; a large quantity of pale urine is passed.

On examination.—A pale, well-nourished baby. On the right side of the abdomen is a hard mass with an irregular surface, which can be palpated bimanually, (? fixed.) It extends forwards from the loin and comes down from under the costal margin.

Investigations.—Cystoscopy: Bladder normal, holding 2 oz.; right ureteric orifice gaping. Instrumental pyelography (1 c.c. of sodium iodide injected): Right renal pelvis and one calyx well-filled with iodide. Right kidney displaced downwards. The appearances suggest the presence of a tumour displacing the kidney downwards. There are calcified areas in the mass. Wassermann reaction negative. Urine: Specific gravity 1011; alkaline; no albumin or other abnormal constituent. Blood urea: 26 mgm. per 100 c.c.

The diagnosis of teratoma rests on the radiological finding of calcified areas in the tumour. Calcification rarely occurs in the so-called renal sarcomata of infants. It remains to decide whether the teratoma is renal or extra-renal. Pyelography shows that there is very little compression or distortion of the right renal pelvis and I am inclined to the view that the case is one of peritoneal or retroperitoneal teratoma.

POSTSCRIPT.—The tumour was removed by Mr. O. L. Addison who reported as follows :—

Notes on operation.—100 c.c. of blood were given to the baby the night before operation and half a pint of saline was injected intravenously at the beginning of the operation.

The mass was separated quite readily from the kidney which was merely displaced. It was so firmly attached above to the under surface of the liver that at first removal seemed quite impossible. Ultimately a line of separation was found and the tumour removed. Hæmorrhage was not serious and the child recovered very quickly from the shock of the operation.

Pathological Notes.—Retroperitoneal teratoma: An irregularly-shaped mass, rather larger than an orange and pale yellow in colour. On section the cut surface displayed a partly solid and partly cystic teratoma: Two cysts containing clear yellow fluid were incised, one appeared to be lined by ectoderm and the other probably with entoderm. Solid portions contained cartilage, bone and marrow. The arrangement of the tissues represented was haphazard.

Calcifying Periosteal Hæmorrhage, following Scurvy.—BERNARD SCHLESINGER, M.D.

History.—Infant, aged 1 year, first seen 22.4.32, with active scurvy, which had given rise to symptoms for ten days. Diet had been as follows: Breast-fed for first month, afterwards had Glaxo. Glaxo was stopped at the age of 10 months, and for

the last two months ordinary diet has been given, including gravy, potatoes and fish, no greens, and only half-a-pint of milk a day.

On examination.—Sharp beading of costo-chondral junctions. Hæmorrhages into gums, enlargement of bones at wrists and knee, which were very tender to touch. Patient was treated with orange juice and unboiled cow's milk, and under this treatment showed rapid improvement.

Calcifying periosteal hæmorrhage following scurvy. Note large size of left leg compared with that of right.

Present condition.—Active scorbutic signs have disappeared, but the left leg is much larger than the right, owing to calcifying periosteal hæmorrhage, which is well seen in a skiagram (see fig.). The skiagram also shows other typical scorbutic changes in the bones.

Nævo-Neurofibromatosis.—REGINALD LIGHTWOOD, M.D. (by permission of Mr. TYRRELL GRAY, F.R.C.S.).

The patient is a male infant aged 8 months, apparently in good health ; the only child of normal parents. The condition described has been present from birth. The skin of the abdomen, back and buttocks is deeply pigmented and covered in part with fine, brown hair. The lesions are roughly symmetrical.

FIG. 1.   FIG. 2.

There are several small, pigmented moles on the scalp and limbs. Under the pigmented skin of the back and abdomen are a number of tumours of varying sizes. Some of these are firm (? neuro-fibromata) and some are soft and lobulated (? lipomata, ? nævoid). There are no neurological signs or symptoms. No histological examination has yet been made.

Dr. PARKES WEBER said he thought that the main features of the case constituted " a pigmented nævus of bathing-drawers distribution." He thought that the hard subcutaneous nodules in this region were neurofibromatous in nature, and analogous to the subcutaneous neurofibromatous masses sometimes accompanying the pigmentation and other lesions of true Recklinghausen's disease.

To face Dermatology

Section of Dermatology.

President—A. M. H. GRAY, C.B.E., M.D.

Rare Type of von Recklinghausen's Disease.—HENRY CORSI, F.R.C.S.

Patient, female, aged 30. Family and personal history good. No evidence of mental deficiency. She seems not to have been concerned about the mild, though obvious, neurofibromatosis of the trunk. The changes in the left leg have become gradually more noticeable since their beginning—in early childhood. On examination of the left leg and lower half of the left thigh, the epidermis is seen to overlie a faintly bluish corium of myxœdematous consistency. There are large areas of this condition, with intervening channels of normal skin. These areas have a gyrate border, abrupt to the eye and finger, which gives exactly the hernia-like feeling characteristic of von Recklinghausen's tumours. The same process, confirmed by microscopical examination, seems to be taking place, but resulting in sheets of degenerated corium instead of in pedunculated tumours. In some places there is considerable thickening of the corium, showing a tendency to what is called by some dermatolysis. On this leg the characteristic patches and spots of pigmentation are more noticeable than elsewhere. They have no relation to the underlying diffuse fibromatosis.

Dr. F. PARKES WEBER said that he regarded the condition of the patient's right lower limb as a good example of what had often been termed "neurofibromatous elephantiasis." The loose neurofibromatous connective tissue might sometimes be associated with—and surround—neurofibromatosis of nerve-trunks (plexiform neuroma). He would describe the present case as one of "generalized neurofibromatosis (Recklinghausen's disease) with neurofibromatous elephantiasis of the right lower limb," the word "elephantiasis" being used in its old descriptive sense to signify any gross (generally irregular) enlargement of a part of the body (as in the terms "parasitic or tropical elephantiasis," "lymphangiomatous elephantiasis," "hæmangiomatous elephantiasis," &c.).

Ulceration of Mucous Membranes: Case for Diagnosis.—MARION RAVELL, M.B. (introduced by H. HALDIN-DAVIS, M.D.).

Mrs. P., aged 26, has had recurrent ulceration of the mouth for sixteen years, and of the vulva for five years.

History.—The patient is the sixth child in a family of twelve, eight of whom are alive, well and healthy. There is no history of syphilis or possible tropical infection.

The patient is married, her husband being well and healthy. There are two healthy children aged, respectively, 5 years and 15 months. There have been short periods of complete freedom from ulceration during the sixteen years.

When first seen (18.5.32) patient was sallow and toxic-looking and had marked dental sepsis. Temperature 99·2° F. There was ulceration of the mouth, tongue, vulva and cervix. The ulcers were superficial and shallow, but well defined, with raised, rounded, non-indurated edges and greyish adherent, sloughy bases. There was destruction of the labia, with considerable scarring of the perineum. The submaxillary and inguinal lymph-glands were enlarged. The pathological findings were not conclusive.

Wassermann and Kahn reactions were negative both in the patient and in her husband. There was a low colour-index and hæmoglobin content. *Döderlein's*

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bacilli were found in smears from the vulva, and *Micrococcus catarrhalis* in smears from the mouth. Streptococci were grown with difficulty in both situations.

Report on microscopical examination.—Chronic inflammatory condition, with no evidence as to the cause.

Treatment.—Small doses of novarsenobillon and tryparsamide intravenously improved the general condition, and existing ulcers healed, but fresh ulcers continued to appear on the vulva and mouth.

Sutton in his " Diseases of the Skin " describes a condition of chronic aphthous ulceration of the mucous membrane of the lip, cheek and tongue, which he calls " periadenitis mucosa necrotica recurrens " or " ulcus neuroticum mucosæ oris," the ætiology of which is unknown. Fordyce has suggested that the lesions were perhaps analogous to the papulo-necrotic tuberculide seen on the skin.

Howard Fox in the *Archives of Dermatology and Syphilology*, 1920, ii, 255, reports a case of aphthous stomatitis of twenty-three years' duration.

" The ulcers were defined, rounded, with no undermining of the edges, and bases of greyish white granulation tissue with no tendency to bleed. Examination of scrapings was negative; on culture, streptococci and staphylococci were obtained." The ulcers healed spontaneously in ten to fourteen days and recurred.

The report on the section was that there was cellular granulating tissue with some œdema and red blood-corpuscles. There were numerous infiltrating cells—chiefly small mononuclear leucocytes—and newly-formed vessels with new connective tissue around them. In the same journal Fordyce reports a similar case associated with ulceration of the vulva.

McDonagh in the *British Journal of Dermatology*, 1924, xxxvi, 285, reports cases of ulceration of mouth and vulva due to the *Bacillus crassus* or *B. döderlein*, and Vincent's organism (the latter being more acute and destructive and having a characteristic odour).

Lipschutz, in 1923, suggested that the *B. crassus* is the pathogenic form of the normally saprophytic *B. döderlein*, which is the causal organism of this type of ulceration. The cause of the change in function is not known.

I have to thank Mr. Haldin-Davis for allowing me to show this case.

Discussion.—Dr. ELIZABETH HUNT said that she had recently had a similar case, but of milder degree, in a girl of better physique. The ulceration had been recurrent in the mouth for three years, and for some six months small ulcers had been occurring on the vulva. The patient was working at a factory handling copper wire, and the question arose whether the occupation had anything to do with it. Superficial wounds on the fingers quickly became pustular, and there was delay in the healing of any wounds sustained. As she showed signs of some constitutional disturbance she was taken into hospital for observation and a general examination was made, but nothing abnormal was found. No pus was present in the swab from the ulcer, no yeasts, or spirochætes were seen—only an occasional bacillus and coccus. Cultures showed a small mixed growth of staphylococci, streptococci and a diphtheroid bacillus. She was treated with a 5 per cent. solution of argyrol and marmite containing vitamins B_1 and B_2. She improved in hospital and was discharged. She reported some weeks later that she was well. That was twelve months ago, and she had not returned.

Dr. PARKES WEBER said he thought that the history of long-continued recurrent ulceration of mucous membranes (not yielding to treatment) in this and rare similar cases suggested that the primary factor was not a local infection, but rather some condition of the mucous membranes analogous to that of the skin in cases of epidermolysis bullosa—even if no familial history were forthcoming.[1] Secondary local infections would, of course, necessarily occur.

The PRESIDENT said that at a meeting of the Section some years ago he had shown a patient whose condition agreed very well with the description of Sutton's periadenitis

[1] An analogy might likewise be suggested with very persistent and recurrent forms of dermatitis herpetiformis.—F.P.W.

necrotica. The lesions of the vulva in the present case corresponded closely with those in his own case, but the mouth lesions were different. Practically all the lesions in his case had begun as deep nodules, more often in the tongue than in the cheek ; there had been only a little diffuse stomatitis. The patient was over 50 years old and had had the condition a number of years. Treatment failed to improve it.

Dr. SYDNEY THOMSON said that some years ago he had had a parallel case in a girl aged 15. The condition had begun with vulval ulcerations, and six months afterwards similar lesions appeared in the mouth. For a long time no treatment was of value, and pathological investigations gave only negative results. Ultimately the condition was cleared up under a three months' course of tincture of iron perchloride by mouth. Later, the patient returned with a vulval relapse, but the iron treatment was again apparently successful.

Complete Alopecia Areata in an Infant.– H. HALDIN-DAVIS, M.D.

This patient is shown, in the first place, because it is exceptional for alopecia areata to develop at so early an age (18 months), and still rarer for it to cause complete denudation of the scalp. It is also interesting because the father is under treatment for choroiditis and exhibits a positive Wassermann reaction. Both the patient and the mother have negative Wassermann reactions. Nevertheless those who are familiar with Sabouraud's views on the ætiology of alopecia areata, and the efforts which he makes to link up that condition with congenital syphilis " fruste," may like to think that this case illustrates his theory. The only treatment has been mercurial inunction into palms and soles ; during the last four months the hair has grown well leaving only two small areas uncovered to justify the adjective " areata."

Extensive Lupus Erythematosus with Subsequent Carcinoma of Lower Lip.—Sir ERNEST GRAHAM-LITTLE. M.D.

The patient, a man aged 45, has had the condition for twenty years or more ; the lesions now involve the entire face and ears, and parts of the neck. The patient has a mouthful of very septic teeth with which he refuses to part, although repeatedly urged to do so. The ulceration of the lower lip has developed quite recently—within a fortnight, according to the history—and has progressed rapidly. It is, I think, malignant. There has never been any X-ray treatment, so that the carcinoma cannot be due to that cause. My impression is that carcinoma is extremely rare in cases of lupus erythematosus not treated by X-rays. The tissues of the neck are so uniformly tense, owing to the lupus erythematosus, that it is impossible to feel whether glands are enlarged below.

Discussion.—Dr. N. BURGESS said that a year ago he had seen a case of lupus erythematosus in which an epithelioma had developed on the nose. At another hospital the patient had had one X-ray application only, and the condition had cleared up under radium treatment.

Dr. A. C. ROXBURGH said that he had seen two cases of lupus erythematosus in which carcinoma had developed, but both had been treated by X-rays, although only in very small doses, namely, one-fifth of a pastille, four or five times. Some cases had been shown to the Section by a member a few years ago which had improved under small doses of X-rays, but Dr. Sequeira and some other senior Members had then said that they considered X-ray treatment contra-indicated in that disease, because epithelioma so often followed it.

The PRESIDENT said he had often wondered whether even in cases of lupus vulgaris carcinoma was more likely to develop if they were subjected to X-rays than if they were not so treated. In both lupus erythematosus and lupus vulgaris it was a question of epithelioma developing in the scar. Certain kinds of scar seemed to have a greater tendency to take on malignancy than others had. It would be of great interest to obtain statistics as to the frequency with which epithelioma followed X-ray treatment, as compared with its frequency without such treatment. He thought the resultant figures would confirm his impression that the tendency was not so much increased by X-ray treatment as was usually imagined.

Swelling on Right Cheek : Case for Diagnosis. ? Granuloma Annulare.—Sir ERNEST GRAHAM-LITTLE, M.D.

The patient is a girl aged 19. The swelling developed three months ago, after she had been in India for about eighteen months. My first diagnosis was that of a deep acne suppuration, but there is no comedo formation, and the persistence of the lesion is perhaps not in accord with that diagnosis. Another possible suggestion is granuloma annulare. There is a somewhat obscure history of an extensive glandular enlargement on both sides of the neck when the patient was in India, so formidable in degree that an operation was proposed, but the glands have since receded and are no longer enlarged. The possibility of leishmaniasis has also occurred to me, but there has been at no time abrasion ef the surface.

Dr. G. B. DOWLING said that he had at present under his care a case exactly like this, the lesion being in the same situation and of the same oval shape. He regarded it as a sebaceous cyst. He could not remove it without causing disfigurement.

Cicatricial Alopecia following Impetigo of Scalp. — Sir ERNEST GRAHAM-LITTLE, M.D.

The patient is a woman aged 64, the whole of whose scalp is covered with pustules, chiefly centred round the hair follicles, and also shows large areas of cicatricial atrophy. The clinical appearance is very like that of impetigo of Bochkart. The first symptom, apparently, was an impetiginous condition behind the ears and under the breasts, dating from six years ago, when she was in South Africa. She has at the present time an impetiginous intertrigo of the breasts and groins and, moderately, of the ear, but the suppuration has been nowhere so free as upon the scalp.

This is perhaps another example of what I consider an extremely rare affection, cicatricial alopecia following upon impetigo of the scalp.

? Telangiectasia Macularis Eruptiva Perstans : Case for Diagnosis.— W. N. GOLDSMITH, M.D.

C. M., male, aged 60.

History.—Duration twenty-five years. The rash followed a severe attack of polyarthritis, after repeated sore throat. No tuberculosis in the family. His general health appears to be good and he complains of no subjective symptoms. He is exposed in his work to heat from turbine boilers.

Present condition.—Extensive eruption on the trunk and limbs, especially on the abdomen. It consists of a deep purple, or mauve, mottled discoloration, which partly disappears on pressure, leaving a somewhat reticular pigmentation. Around the shoulder-girdle and on the scrotum are small follicular papules, which necrose in the centre and leave scars. There is no general atrophy. On the arms the lesions are slightly more discrete. These do not become separately urticate on rubbing, but he has factitious urticaria.

Biopsy, (May 27, 1932. Dr. Muende) : "There is marked œdema of the pars reticularis and papillaris with dilatation of the papillæ. The blood capillaries and lymphatic spaces are very dilated. There is considerable hyperplasia of endothelial cells, and few giant cells are present around a hair follicle. There is a very dense small round-celled infiltration of the upper corium. There is no excessive pigment. No mast cells."

Dr. PARKES WEBER said he thought that the case was of the same nature as those described by himself with Dr. Hellenschmied (*Brit. Journ. Derm. and Syph.*, 1930, xlii, p. 374) and by Dr. H. W. Barber (*Proc. Roy. Soc. Med.*, 1932, xxv, p. 1029) under the heading "Telangiectasia Macularis Eruptiva Perstans." After Dr. Hellenschmeid had left England, he (Dr. Weber) suggested that these cases were a very telangiectatic and relatively pigmentless variety of urticaria pigmentosa of adults, and in Dr. Barber's case lesions in the upper limbs resembled

those of typical urticaria pigmentosa of adults.   The case of a man described by Osler under the heading "Telangiectasis Circumscripta Universalis." (*Johns Hopkins Hosp. Bull.*, 1907, xviii, p. 401) was probably of the same nature.   The main features of Osler's case nearly corresponded to those of the present case; marked urticaria factitia could be excited in both, and both patients gave a history of nervous prostration.   Osler had alluded to certain cases described by L. Brocq and others in France as almost certainly of the same nature, but no one had previously suggested that the condition was a very telangiectatic variety of (or closely allied to) urticaria pigmentosa of adults.   In the present case, the pigmentation in some of the lesions was extremely well marked, and Dr. Barber had demonstrated the presence of mast-cells in one of the lesions in his case removed for microscopical examination.[1]

Erythema Elevatum Diutinum.—A. M. H. GRAY, C.B.E., M.D. (President).

The patient is a female infant, aged 8 months.   The eruption began with a small red spot, like a bruise, on the right buttock, when the child was three weeks old, and this gradually spread to its present size.

There is now a slightly raised, infiltrated, purple-red plaque, with a sharply defined, but slightly irregular, edge, measuring about 3 in. by 3 in. on the right buttock.   The surface is smooth and shiny.

The child has had four doses of X-rays, each of one-third of a pastille, the last, three weeks ago, and the patch has slightly flattened down since first seen.

Microscopical examination of a section of the affected area shows the changes to be confined to the dermis.   The papillary layer is rich in fixed connective tissue cells; below this the main mass of the dermis is composed of fibroblasts and newly formed connective tissue, arranged in quite an irregular fashion.   The hair follicles and sweat glands are not involved.   In places small collections of round cells can be seen in the perivascular spaces and between the fibroblasts, but most show degenerative changes.

The case seems to be characteristic of Crocker's erythema elevatum diutinum, as described by him.   He says that :—

" The lesions are nodules, from a small pea to a bean in size, pink in the early stage and purplish in those of long standing.   Convex at first, they tend to coalesce into irregular lobed infiltrations and to flat raised plaques, but in severe cases distinct nodular tumours are present, even on the palms and soles.

" The growths are very firm to the touch and are painless.   They develop on the extensor aspect of the limbs over the articulations, elbows, knees, and phalanges of hands and feet. They also affect the palms and soles, and the buttocks and ears.   In my case, and in White's quoted by Hutchinson, the tumours underwent involution, but in others they were persistent for years and would probably be permanent on the hands.   All but one were females, and all were children or young adults.   Either in themselves or in their family history there was strong evidence of gout or acute rheumatism.

" *Pathology.*—They appear to be fibromata of inflammatory origin in the corium.   The fact that many of the lesions involute is against their being true neoplasms.   Probably they are analogues of the subcutaneous rheumatic nodules.

" The histology of a lesion from the knuckle of Williams's and my case showed that the lesion was beneath the epidermis in the deep portion of the corium, all below the coil glands being normal.   It consisted of a fibro-cellular structure, which in great part replaced the normal fibres of the corium.   The fibres followed the course of the vessels, being horizontal immediately below the papillary layer, vertical or oblique above, and branching horizontally below in the deep portion of the corium.   The cells permeated the interstices of the fibres either singly or in clumps, and formed accordingly a dense fibrous or loose fibro-cellular structure.   The sweat coils were very little, if at all, affected, and no hair follicles were found in the sections.   In long-standing cases like Middleton's the fibrous tissue is more developed, and he found the coats of the arteries infiltrated with cells."

[1] The presence or absence of mast-cells might depend on the stage in the evolution of the lesion examined.—F.P.W.

Discussion.—Sir ERNEST GRAHAM-LITTLE said he was glad to have seen this case, as he had not been sure what the elevatum diutinum of Crocker was. When he, the speaker, wrote his paper on granuloma annulare, a long time ago, there was a general consensus of opinion expressed—by Crocker, Galloway, Pringle and Fox—that the cases of so-called elevatum diutinum were really cases of granuloma annulare. The present case, he considered, differed from the aspect of granuloma annulare in the absence of the discrete nodules, which were characteristic of granuloma annulare. There seemed in the President's case to be a continuous sheet of disease.

Dr. GOLDSMITH said that he agreed with Sir Ernest Graham-Little; there were some striking differences between this condition and granuloma annulare. This case was exactly like one which he himself had shown (also a case of the President's). In that case the main lesion had been a slightly convex, red, raised plaque; there were also some smaller outlying nodules, but none so small as a typical lesion of granuloma annulare. Neither X-ray treatment nor the performance of a biopsy had led to any noticeable improvement.

The PRESIDENT, in reply, said that decision was difficult from examination of the section; it must depend on the stage at which the condition was seen. When new fibrous cells were present there would probably have been a necrosis of the collagen bundles, and now one could see the stage of repair. The striking thing about granuloma annulare was that one saw a small, sharply circumscribed area of necrosis because the lesions were small, whereas this condition was apparently more diffuse. He thought, however, that the basic histology was more or less the same. Whether they were clinically the same was a question. There were a number of cases which had been labelled and accepted as cases of granuloma annulare, in which, even if they had begun with fine nodules, these had disappeared, leaving a plaque-like condition like that seen in this case, but with a tendency to flattening and involution. There was a clinical resemblance in the final stages between granuloma annulare and this type, though the initial stages were clinically different. Another striking feature was that they seemed to appear in the same places.

Section of the History of Medicine.

President—Dr. R. O. Moon.

[*May 4, 1932.*]

The Morphology of State Medicine in Great Britain.

By Harley Williams, M.D., D.P.H.

A STUDY of the rise of State Medicine is not only interesting, but should help us to find an answer to some of the perplexing questions of to-day, as for instance :—

(1) What is to be the relation of the State to medical practice ?

(2) Is State Medicine the same thing as Preventive Medicine ?

To the observer who examines the present fabric and function of State Medicine from the standpoint of logic, expediency or completeness, there must come that saddening sense of incapacity, felt by Leigh Hunt, who after reading Browning's " Pippa Passes," feared he must have become insane, so incomprehensible did the construction of the poem appear to him. The only way to understand the complicated growth of this system is to study it from the evolutionary point of view, not merely as a historical narrative, but following tendencies and vestigial remnants in the way that the biologist observes the development of an organ.

We have at the present time a set of health laws forming a code, a legion of skilled practitioners to administer them, and an elaborate structure of constitutional machines, called Local Authorities, controlled by, or themselves controlling, a central organ, the Ministry of Health. These members have never been planned ; they have grown together fortuitously. For the most part they are to-day fulfilling a function entirely different from that designed, and by a method of procedure which is formal and archaic. Indeed, it is not going too far to say that the most valuable and constructive work in this department to-day is performed without the aid of those elaborate mechanisms and safeguards with which our predecessors sought to regulate the future.

In embryology the usual force which develops a tissue is function. An organ may be considered the most harmonious result of the interaction of forces in the work that it has to perform. There is no sounder rule than this, that function determines form.

Is this the case in State Medicine ? Are its various parts adapted to the work they were intended to do ? We must answer, " No." There are but few instances where the means seem to subserve the needs and the explanation is that the various parts of State Medicine, both historically and as a matter of fact, are not in Great Britain calculated to perform the function for which they were designed, either completely or efficiently, but to satisfy certain principles which we know to-day to be quite unconnected with Public Health.

The principle which the early Public Health legislators thought to be supreme was the ideal of constitutional liberty. The history of Public Health control is largely an account of how this personal liberty has been encroached upon in the public interest.

To estimate the importance of the first great Public Health Statutes, one must go back to 1795, to what was called the " Speenhamland Act of Parliament." This was really nothing but the decision of the quarter-sessions of a little town in

Berkshire which fixed the scale of poor relief for the agricultural labourer.   As the decisions of the justices were binding upon the Poor Law overseers, the standard laid down became the legal minimum, and was widely imitated all over the country. Poor relief became a subsidy to wages.

This was the time of the gigantic financial and military opposition to Napoleon, engineered by Pitt, but when the war was over, a slump—of which we in our own time have witnessed the like—fell with unprecedented severity upon commerce and agriculture.

The first Parliament met in 1832 and the policy of the workhouse test became the groundwork of the new Poor Law Amendment Act of 1834.   The facts are well known.   The Act largely reflected the ideas of Edwin Chadwick ; the Poor Law Board, which he was later to dominate and finally to wreck, was constructed largely upon his ideas.   The Public Health interest of this Act lies in the fact that by amalgamating the Poor Law parishes, numbering some thousands, into Unions, it formed the beginnings of what we now know as Local Health Authorities.   It was in fact a measure of centralization such as has been very common in commerce since the war.   It created the Poor Law Guardians, who were generally magistrates appointed by the Crown, and it set up an entirely new thing in English constitutional practice, a Central Department, called the Poor Law Commissioners, of which Chadwick became secretary.

It is difficult, nowadays, to appreciate the reasons which prompted so novel a step.   By the Factory Act of 1833, professional travelling Inspectors had been appointed, and even given the powers of a Justice of the Peace, for trying cases under the Acts.   Of course, they favoured centralization, as against the Magistrates who were often lax and dilatory in details which were disagreeable to themselves or their friends.   The Factory Acts seem to have introduced the tradition of paid officials entering into what had formerly been exclusively the sphere of amateurs. Their presence was regarded as an intrusion, and in the case of Poor Law this feeling was not improved by the extraordinary ruthlessness shown in the conduct of the Poor Law Board.

It is well known that Public Health came out of Poor Law, and this obstetrical miracle seems to have been performed entirely by Chadwick.   It is to his credit that he grasped the extent to which sickness was the cause of pauperization, but he was an economist, without medical training, and the later disasters of his career can be largely attributed to this fact.

The Public Health Act of 1848 stereotyped a method of procedure which every Medical Officer of Health uses to-day, and it is interesting to examine its meaning. The framers of the Act seem to have looked around for some local body to carry out sanitary improvements.   Under the cholera emergency legislation of the thirties, Local Boards of Health, consisting of the magistrates and clergy, were hurriedly improvised, and under the influence of panic and the vague but pressing necessity to do something, important decisions for enforcing quarantine and preventing contagion were taken in the tradition of the seventeenth century.   Since that time the local Boards of Guardians had been created and Parliament turned to them as the only convenient body of persons to administer Public Health, but the Guardians were generally a Board of Magistrates, stiffened by one or two nominees from the Central Department.

Now by the Public Health Act, 1848, the Guardians were made nuisance authorities, that is, they were given the power to complain to the magistrates of breaches of the new sanitary code.   Upholders of the constitution felt that the administrative side must be kept quite distinct from the judicial.   Legal forms of procedure must be maintained and the notion of giving the new Local Authorities powers to take action on their own account would have seemed unconstitutional and absurd.

This arises out of the negative character of English Common Law which is disinclined to lay down abstract principles and rarely envisages procedure of a preventive kind.

The General Board of Health was also the creation of the Act of 1848. It consisted of a Minister of the Crown, one unpaid Commissioner, and one drawing a salary—this last appointment being held by Chadwick. No doctor was on the staff except in times of epidemic. Its powers were strangely limited. It could not in practice compel the Guardians to do anything they did not wish to do. It could not coördinate the Public Health Services. If allowed half a century of patient observation of the best methods practised by progressive Local Authorities, the General Board of Health might in time have drafted all the Public Health Statutes, and a more comprehensive and more efficient scheme in this country would have been the result. But the Board of Health possessed no legal powers. It possessed only Edwin Chadwick, with whom the incompetence of amateur magistrates amounted to an obsession.

Chadwick was alone. No one else knew—or, indeed, cared anything for—the peculiar kind of reforms which he favoured. The agitation of the Chartists, the repeal of the Corn Laws, the great Exhibition in Hyde Park which was to herald a reign of universal peace, all seemed more interesting topics to the average legislator than England's growing Public Health Scheme. In addition to the unfamiliar character of his policy, Chadwick was personally distasteful. One by one his supporters fell away, and in 1854 the General Board of Health was abolished, and sixty years passed before England had a Department specifically engaged in the work of Public Health reconstruction.

One of the persons who, behind the scenes, lamented the fall of Chadwick, was the Prince Consort. When medical affairs were transferred to the Privy Council in 1858, it was his influence which secured the retention of Sir John Simon as adviser. This capable administrator carried the flag single-handed for a period of fourteen years, until in 1872 a fresh Central Department took over some of the work of directing State Medicine. The Prince died in 1860, and it is interesting to speculate as to what might have been the result had he lived a little longer to impose his scientific views upon the legislators. Lytton Strachey thinks that he might greatly have enlarged the royal prerogative. If so, it is almost certain that one Royal Act in the next twenty years would have been to create a strong central force in Public Health matters, and it is, I think, one of the ironies of medical history that a single decade should have seen the eclipse of two figures such as Chadwick and the Prince Consort, both so alien to the spirit of their age, but whose views have been so largely justified by their successors.

The Privy Council is a machine for registering constitutional decrees. Some remnant powers of the old Board of Health were continued in it, and Sir John Simon now became the personification of English State Medicine. If one looked for the antithesis of Chadwick, it would be difficult to discover anyone more completely so than he, or more conciliatory and wise.

Above all, he was a pathologist by training, and his knowledge of medicine had been obtained by actual practice among the sick, and was not founded on the intensely narrow observation of the inspired amateur, determined to prove a thesis.

One of the features of this interim period before the great Public Health Act of 1875, is the creation of the Metropolitan Asylums Board in 1867. This was partly the result of a humanitarian agitation organized by the *Lancet* about 1865, which in a series of startling disclosures revealed the scandalous condition of the workhouses. Another centralizing Act created the Metropolitan Asylums Board and fused together the interests of all the parishes in the area. It was within the next thirty years that most of the large Metropolitan workhouses, infirmaries and fever hospitals were built by this authority, and many of the difficulties of the

London County Council to-day, in adapting them to modern needs, have their roots in the period which followed Chadwick's fall, when there was no responsible agency to advise or compel measures founded on medical facts. The workhouse infirmary, indeed, was an anomaly never contemplated in 1834. The principle was to eliminate the poor by coercion. In theory, workhouses would be needed only for the few, but in practice the rigour of this principle had everywhere to be diminished, and as a matter of internal convenience the workhouse infirmaries were built to house the sick and infirm paupers. But the old tradition lingered. Some of the hospitals were constructed like prisons. The spirit of hardness and repression seems to have impregnated the whole administration, and it was not until 1897 that the practice of employing inmates as nurses in the wards finally disappeared, and not until 1913 that the workhouse infirmaries were permitted to aspire to the standard of the general hospitals.

The impulse to public health reform gave rise to various commissions and inquiries set on foot by Simon. An epidemic of cholera quickened into being the Sanitary Act of 1866, which, for the first time in English history, laid it down an imperative duty of the Local Health Authorities to search out the nuisances in their districts and have them removed. Mr. Gladstone appointed a Commission to go into the matter further, and the Act of 1871, creating a new Central Department, was the result. Just as the Poor Law Act of 1834 had formed the model for the creation of new Public Health Authorities in 1848, now the authorities were set up before their powers were adjusted in 1875. The appointment of Medical Officers of Health was made compulsory and also that of the Inspector of Nuisances.

It is about this period that a strange and important decision was taken. We have seen that all over the country there was a network of Poor Law Unions, each with its Medical Officer, and Guardians of the Poor were also Nuisance Authorities, and by the Act of 1872 they were created the new Public Health Authorities in rural areas. It would have been easy for the existing Poor Law medical men to be made Medical Officers of Health. This would have avoided the breach of unity between two branches of medicine. It is possible that no special Public Health Service would have arisen. Perhaps we should hear less at the present time about encroachments on private practice, and the conflict between "preventive and curative medicine." The causes of this decision to create separate medical officers of health are obscure. Certainly the influence of Simon was against the fusion. Here again, I think that if there had existed between 1858 and 1872 an efficient central Public Health Department, the advantages of unity would have become apparent. The Public Health system would have grown naturally out of what was before.

Against this view it may be urged with great plausibility, that the infant science of Public Health would have been threatened almost at its birth with Poor Law restrictions and that the fundamental departure of 1872, although introducing disunion into medical practice, saved sanitary science from the complete eclipse which the Poor Law was to undergo after sixty years of decline towards obloquy and extinction.

The great Public Health Act of 1875 was passed by Disraeli's first Government. It is merely a consolidating Statute and perpetuates most that was valuable in the previous Public Health Acts and Nuisance Removal Acts.

In 1872, Parliament willingly conceded to the Central Department powers which would have gladdened the heart of Chadwick forty years before.

The great Public Health Act had given England its authorities, rural and urban, with their extensive powers, and medical officers of health, compulsorily appointed. Public Health had emerged from the Poor Law and the foundations laid for the great administrative development which we have seen in our own time. But left alone in the condition which it found itself in 1875, preventive medicine probably

would not have attained any security, because of the exceedingly patchwork division of the country into the urban and rural authorities. The towns had their privileged constitution under the Municipal Acts, and a host of *ad hoc* bodies of commissioners for particular purposes. The rural sanitary districts were merely the Unions of Parishes, created for Poor Law convenience, by Chadwick in 1834. All that the Act of 1875 had done was to regularize existing arrangements and prune the exuberant growth of special vestries, local boards, parish meetings, sewer commissioners, etc., which Parliament had created or allowed to continue.

But another force, touching particularly the rural areas, was beginning to affect Public Health. Hitherto, domestic government outside the cities was entirely in the hands of the magistrates. Quarter-sessions in the seventies occupied the position in local affairs which to-day is taken by the great departments in Whitehall. There was still no distinction between their judicial and administrative functions, and the position of Provincial government resembled that of the sovereign authority six hundred years earlier.

The magistrates, sitting over brandy punch, might still discuss the appointment of a part-time medical officer, in the same manner as they punished vagrancy, administered the prisons, tried petty larceny, or repaired the high roads, and if they went wrong in any of these functions the only remedy was a writ of *Mandamus* from Queen's Bench.

Lord Salisbury's Act of 1888 created the County Councils on an elective basis, and for the future the immemorial rulers of rural England had to offer themselves to the popular suffrage, just as candidates for Parliament. At first the Counties and the County Boroughs that were formed with them had practically no Public Health powers, although they might, if they wished, appoint a Medical Officer of Health.

The districts remained, as they do to-day, the primary Public Health authorities to administer all the Acts. The County Council became the federal power with only a very limited range.

Warfare seems to induce subconsciously in mankind the desire to protect and foster the offspring, in order to repair the damage. It is noteworthy that after all wars the male birth-rate rises.

After the South African war it was shown that large numbers of our people were clinically unfit and of poor physique. Colonizing impulses were in the ascendancy. The idea of better feeding, curiously blended with schemes of military training in schools, inspired the Acts for medical inspection in schools and the feeding of necessitous children which were among the first measures of the Liberal Government of 1906. A Department of Education was formed, and Sir George Newman joined the public service. The School Medical Service soon began to reveal the defects in the health of the school population, but it discovered also that the prevention of these defects must begin very much before school age, and this drew attention to our midwifery services. Although the provision of meals for children and the discovery of remedial defects, followed by a certain amount of medical treatment, have been of great value, the school medical field has yet to produce its finest fruits.

The Midwives Act of 1902 had reduced the ranks of the unqualified handy-women. The Central Midwives Board, by the standard which it set and the rules which covered the treatment of cases in a most detailed manner, saturated the practice of midwifery with order, but it was not until 1918 that there was any enforcement of the duty of the Local Health Authorities to provide proper maternity services by paying the doctor's fee when he is called in by a midwife. The power of inspecting midwives has been capriciously given and taken away from the district councils, and at the present time is in the hands of the County, with power to delegate to the Districts.

I confess, at this stage, that I am unable to observe any principle on which the

various health services are arranged. It must be remembered that the Rural and Urban Districts were still the predominating health authority, and it was not until the Town Planning and Tuberculosis legislation that the County and County Boroughs received any very large accretions of power. But it is necessary for the moment to return to Chadwick's Poor Law Authority, the Guardians of 1834. At the beginning of the century, the position was that these bodies were giving medical relief on a large scale, and all of them had some hospital accommodation, some of it very bad, some of it on a level with the voluntary hospitals, and in an important case decided in 1901 the beginnings of our recent difficulties connected with the status of the healthy unemployed men may be detected. It seems characteristic of the Poor Law in England that it provokes vigorous reaction. Its shadow had brooded over the beginnings of Public Health during the crucial later years of last century, and now, indirectly from Poor Law, was to arise the experiment of National Insurance. It will be remembered that the famous Commission on the Poor Laws was appointed in 1905, and did not issue its Report until five years later. It is ancient history, too, that the majority report was of less importance than the minority statement of Mrs. Sidney Webb and others. But there is no doubt about the evidence which this Commission collected. In State Medicine the system of concurrent powers had arisen, and everywhere the machinery for safeguarding health was being duplicated in an absurd and arbitrary way. The official Public Health Services which originally had set out merely to isolate infectious diseases and treat individuals for the benefit of the community, now seemed to be combining the ideal of treatment with that of prevention. The isolation of infectious cases, although still in the popular mind a necessary procedure, was beginning in scientific circles to go out of fashion. Above all, the system of medical attention for the working class was everywhere inadequate, in spite of much expenditure and hospital provision.

The Minority Report recommended that the Health Services of the Poor Law should be taken over by Local Authorities. This was not realized until 1929, and then only in theory. In the intervening period several new forces in State Medicine made themselves apparent.

In common, I suppose, with other statesmen of the day, Mr. Lloyd George had read the Minority Report of the Commission on Poor Law, but it made less impression on his mind than what he had seen in Germany, and the National Health Insurance Act of 1911 was true to the tradition of English Local Government, in that it created a perfectly new Local Authority, the Insurance Commissioners with the County Insurance Committees. I do not propose here to go into the developments which have flowed from the National Insurance Act, except to say that it kept alive many tendencies which would probably, without its influence, have disappeared a few years later. One thing seems certain, that the passing of this Act has postponed indefinitely the creation in England of what is popularly but inaccurately called a State Medical Service, that is to say, a system of medical practice officered entirely by salaried doctors.

It is time to speak of the Tuberculosis Movement which has produced remarkable fruits, and has introduced into English State Medicine a tenacious influence. After the discovery of the tubercle bacillus by Koch, just half a century ago, the first movements towards controlling the disease were entirely voluntary. Sir Robert Philip's Tuberculosis Dispensary was opened in Edinburgh in 1887 and for many years was the only scheme of its kind. Most of the early sanatoria were built by voluntary enterprise, but their number was woefully inadequate, as was revealed when, in 1912, the Insurance Commissioners began to make arrangements for giving an insured person, suffering from tuberculosis, the sanatorium benefit to which he had a statutory right.

I am not aware whether the idea of coördinating the medical services into one

organic whole was considered very much before the war, but the experience which the Government departments obtained in large scale organization was applied to the Public Health scheme, and summarized in the Report of Lord Haldane's Committee on Reconstruction in the Public Services. I think the Act creating the Ministry of Health may be taken as the beginning of the unifying tendency which has been so conspicuously absent in the first part of the history of State Medicine. One of the needs which became apparent after the European war—and was probably the cause of more failure than any other influence—was the multiplication of authorities and persons concerned in little phases of public health. This, as we have seen, is characteristic and flows from the English legal tradition to make a change piecemeal and to read an Act of Parliament only with the narrowest possible construction. The Minority Report of the Poor Law Commission was dug out and much of it reproduced by the MacLean Committee on the provision of medical and allied services. The Onslow Commission on Local Government had much to say on the overlapping in the counties. In 1927, only about one-third of the sanitary districts in England had a whole-time Medical Officer of Health. Although more responsibility was given by Statute to the County Councils, the districts were still the local Public Health Authority, even before the Local Government Act. In one or two counties an attempt had been made to coördinate the district services under the nominal control of the County Medical Officer of Health.

The Local Government Act of 1929, although it happened to be passed by a Conservative Government and in its structure incorporated many political tendencies, was chiefly the embodiment of what experts in Public Health had been recommending for years. It boldly abolished the Poor Law, and in future social services for the destitute were to be called public assistance. But too much must not be read into this intention, for the Act only gave authority for Poor Law services to be administered in future by the County and County Borough Councils, and up to the present time the cases in which the Counties have decided to carry out this provision are not numerous. So, after nearly a century of development, Public Health at length sloughed off the old Poor Law.

The formal period is over, the unitary phase well begun, and perhaps in our generation we shall see the beginning of the constructive epoch in a better application of scientific knowledge and more research to increase it.

It is my thesis to-day that State Medicine constitutes a definite system which is yearly enlarging its province and, as some will say, encroaching upon other forms of practice. In so far as our present arrangements are defective, I think State Medicine will take their place. I do not believe that what is strong and valuable will be allowed to disappear.

It may be that the medicine of the State is designed to fortify our present methods of healing the sick. It may prevent our modern system of scientific medicine, based on observations and experiment, from being swept away by a wave of obscurantism, like the Hippocratic art centuries ago.

Sir WELDON DALRYMPLE-CHAMPNEYS: In writing of the changes in the public health conscience of our people which had marked the first fifty years of Queen Victoria's reign that great pioneer, Sir John Simon, remarks:—

"At the present time, when care for the Public Health has become a familiar branch of local government, employing day by day many thousands of permanent officers, and having tens of millions of money already sunk in the mechanical appliances which it finds needful, the recollection that, when the reign began, little more than fifty years ago " (he is writing in 1890) " there existed hardly a glimmer of intelligent public interest in this question, shows indeed an astonishing contrast."

Dr. Harley Williams has emphasized the rather haphazard manner in which our State Medical Service has evolved from the Elizabethan Poor Law, first as an economic reaction against the scandalous conditions of the eighteenth century, and later under the stimulus of new theories as to the influence of environmental conditions upon the health of the community.

Now in studying this Victorian revolution, together with the slow developments of the preceding centuries and the rapid progress in our own times, I have been struck by a certain rhythm which seems to pervade these movements.

In the development of our State Medical Service one may note a diphasic variation: (1) from the parochialism of the Elizabethan Poor Law to centralization, a change due to the work of Chadwick and the Royal Commission of 1838; (2) from the strong centralization of the Local Government Board to modern decentralization and the development of the principle of local responsibility, a gradual process finding its most concrete expression in the Local Government Act, 1929, though this Act also tends to transfer control from the smaller to the larger local authorities.

The State Medical Services of the various civilized countries of the world have developed along very different lines. This was both inevitable and desirable; inevitable, because at the time when each State first realized that the health of its individual citizens was a matter of capital importance to the community as a whole, its existing institutions, which formed the foundations on which the superstructure of its State Medical Service must be built, differed from those of other countries—and desirable, because in the process of evolution it is only by perpetual and prolific variation that the type best suited to the particular environment can be produced.

Nothing is more stimulating or refreshing for anyone connected with the Public Health Service than to watch, as I have had the opportunity of doing in a number of foreign countries, the manner in which the great principles of preventive medicine have been—and are being—adapted to the most varied conditions of climate, soil, customs and temperament. We in this country are justly proud of our pioneer work in public health, not only at home but also in our colonies and dependencies, and one has only to see this work in progress to realize the wonderful adaptability of the supposedly " insular " Briton to all sorts of strange conditions.

Several European States which have come into existence, or whose sanitary consciences have awakened, since the late war have, after careful consideration and consultation with experts provided by the Health Organization of the League of Nations, decided to adopt a comparatively elaborate form of State Medical Service, though in most instances only a part of the complete scheme has been put into operation at first. Here again it is gratifying to note that the English system has formed the basis of most of these new organizations, and that in one instance at least it has been adopted almost *in toto*.

Decentralization is only possible in a highly organized community, and where public education in health matters has advanced to a point at which the intelligent co-operation of the community as a whole can be counted upon.

Though the far-reaching changes initiated by the Local Government Act of 1929 are too recent to allow of a final judgment as to their success, yet the smoothness with which the new machinery has worked on the whole has convinced those concerned with its operation of the general soundness of its design and of the firmness of the foundations prepared for its reception since 1838. In our admiration of the design and our pride in the foundations (of which the English character forms no small part) let us not forget to praise the engineers who started this great machine running so smoothly. Credit is due to the local authorities of the whole country and especially to their medical officers of health, but no local authority was faced with a more tremendous task, or accomplished it more efficiently, than the County Council of our great capital.

Speaking of Captain Cook's feat in the " Resolution " during his voyage round the world and of the means " by which," as Sir John Pringle, President of the Royal Society, when presenting the Copley Medal remarked, "under the Divine Favour Captain Cook with a company of 118 men performed a voyage of three years and eighteen days, throughout all the climates from 52° North to 71° South, with the loss of only one man by disease," Simon says that " all who would study the case must of course bear well in mind that method and man were co-efficient." Nowadays, when the importance of administration has almost been lost to sight in an orgy of legislation, let us remember that the most perfect method ever evolved depends for its effectiveness on the co-efficiency of the men who use it, and that if we want our State Medical Service to bring us full benefits, we must see to it that the cream of our medical students are attracted to a career, the responsibilities of which have in recent years increased so enormously and so far out of proportion to its remuneration—that of the Medical Officer of Health.

Section of Laryngology and Section of Otology.

COMBINED SUMMER MEETING HELD AT THE EYE AND
EAR HOSPITAL, PORTSMOUTH.

Chairman—Mr. WALTER HOWARTH, F.R.C.S., President of the Section
of Laryngology.

DISCUSSION ON REFERRED PAIN.

Pain Referred to the Ear.

x

when the teeth are apparently painless, and pain in the teeth often comes from the antrum.   Pain is often referred to the wrong tooth, but not across the middle line.

A common but less simple occurrence is pain referred to one ear, which shows neither inflammation nor deafness.   Inflammation in the ear rarely causes referred pain, although pain may radiate to the temple and in extradural abscess or caries of the labyrinth, towards the vertex.   Reflex cough from syringing the ear is analogous, but there is no reflex pain.   Albert Gray mentions in his book, however, a case of [2] otitis media in which pain was experienced only in the gums.

The source of referred pain in the ear is generally either in the pharynx—for instance a calculus in the tonsil [3], an epithelioma of the pharynx—or else in the teeth.   The classical example is an unerupted or partially erupted wisdom tooth, but any molar may cause pain in the ear, and also a bicuspid, which is less common. Unerupted teeth may cause extraordinary reflex symptoms.   A lady had pain in the right mastoid process, which was tender, functional deafness in the right ear, and left hemianæsthesia, besides pain in the face.   Her dentist noticed that one of the upper bicuspids was a milk tooth.   When the unerupted tooth, which lay horizontally in the jaw, was removed, all the symptoms disappeared.

Other causes of pain in the ear are an empyema of the antrum or of the sphenoidal sinus, and malignant disease on the back of the tongue.   Dundas-Grant has spoken of a case in which the pain had its origin in the submaxillary gland [4].   Expressed in another way, a lesion situated in the area of distribution of the trigeminal, of the glossopharyngeal, or the superior laryngeal branch of the vagus may produce pain referred to the ear.

I am indebted to Mr. Tilley for the diagrams, taken from Fenton and Larsell, which elucidate the anatomical explanation.   They make the observation that for referred pain to arise, the ganglion cells of the afferent fibres from both regions must be situated either in or near the same sensory ganglion, and that centripetal processes from both sets of cells must pass together into the bulb.

These conditions are illustrated in a simple form where the gasserian ganglion dominates the whole field.   It is more complicated to bring the ear into the area of the trigeminal.   Fenton and Larsell showed that sensory fibres from the mucous membrane of the palate and nose pass through the spheno-palatine ganglion and the great superficial petrosal along the vidian nerve to the cells of the geniculate ganglion [5].   There is also a small sensory branch of the facial distributed through the auricular branch of the vagus to the posterior part of the external auditory meatus, the tympanic membrane, the skin over the mastoid process and the back of the concha.   The fibres of this nerve pass to the cells in the geniculate ganglion.   In this way deep visceral and superficial cutaneous or somatic areas are brought into relation, and pain in the ear arising, for example, from the sphenoidal sinus, is explained.

In the case of an epithelioma on the base of the tongue or fauces, the path of the painful sensation would be along the glossopharyngeal, and the tympanic branch which arises from the petrous ganglion of the glossopharyngeal and reaches the tympanum by the canal of Jacobson provides the explanation of referred pain.   In addition, the continuation of Jacobson's nerve as the small superficial petrosal is joined by a branch of the seventh from the geniculate ganglion.

In tuberculous or gummatous laryngitis the painful sensation would arise in the area of distribution of the superior laryngeal branch of the vagus, which takes origin from the lower part of the ganglion of the trunk.   The ganglion of the root which lies above in the jugular foramen gives origin to the auricular nerve of Arnold, and thus an anatomical explanation is supplied.

Pain in the ear from the submaxillary gland may be explained by the junction of the lingual nerve and the chorda tympani, which supply the roots of the submaxillary ganglion.   The chorda tympani has some fibres connected with cells in the geniculate ganglion.

John Hilton [6] in his "Rest and Pain," however, gives a simpler explanation of pain in the ear. He tells of a case in which a man attempted to cut his wife's throat, but only managed to cut the great auricular nerve, and so Hilton was able to mark out, by means of the anæsthesia, the area supplied by the auriculo-temporal, namely, the upper and anterior part of the auricle and meatus. He records cases of ulceration of the tongue with pain in the ear. He marks out the painful part of the ear as that supplied by the auriculo-temporal, and he says that in such cases there may even be ulceration of the meatus and a discharge due to referred irritation.

This path for the reflex is less complicated than the other, and it indicates, I think, that we ought to investigate more carefully cases of referred pain. When a patient has referred pain in the ear we are apt to assume that it is in the tympanum, but Hilton is possibly right that the seat of such referred pain may be in the auricle and outer part of the meatus.

The conclusion is that pain is not referred in an irregular manner, and that we should seek to bring the site of origin and the site of the sensation under one umbrella, as it were, for there is some controlling ganglionic connection.

But even then there is still no explanation why the pain is referred wrongly, or why the nervous system should make this mistake in localization. According to Henry Head, the pain is felt in the thalamus and it is analysed in the cortex. Why does the cortex make this mistake? I think that when pain is referred wrongly it generally so happens when the affected part is one that is infrequently the source of afferent impulses which reach the level of consciousness, and so the pain is referred by the cortex to a related area more familiar with the appreciation of painful impressions and sensations.

Two cases illustrate briefly how referred pain may be of vital importance. Dr. Watson-Williams has described how a boy from the age of 14 had severe pain in the ear, which showed nothing wrong. He was seen by Arthur Cheatle who found no sign in the ear, and afterwards by Victor Horsley when he was dying from meningitis. At the necropsy pus was found around the sphenoidal sinus.

Mr. Mollison sent to me a patient suffering from a lateral wall epithelioma low down in the pharynx. He had been treated for six months by an aural surgeon for pain in the left ear, which was in all respects normal. Although the patient remains well after three years, the operation had in consequence to be very extensive.

REFERENCES.

[1] Works of John Hunter, F.R.S., vol. ii, p. 78, Longman, London, 1835.   [2] A. A. GRAY, "Diseases of the Ear," London, 1910, 168.   [3] TILLEY, *Proc. Roy. Soc. Med.*, 1929, xx, 1279 (Sect. Otol., 67).   [4] DUNDAS-GRANT, *Trans. Med. Soc. of London*, 1929, lii, 161.   [5] FENTON and LARSELL, *Annals. of Otol., Rhinol. and Laryng.*, 1928, xxxvii, 739.   [6] JOHN HILTON, F.R.S., "Rest and Pain," 1898, 5th Ed., 76.   [7] P. WATSON-WILLIAMS, *Proc. Roy. Soc. Med.*, 1929, xxii, 1430 (Sect. Laryng., 60).

Dr. PATRICK WATSON-WILLIAMS said that he could not agree with Mr. Colledge's suggestion that pain referred to the ear when the source was elsewhere could be explained as a mistake of the cortex. The point was of some importance, and one reason why he did not agree was that firm pressure on the tragus of the same side usually had the effect of markedly reducing or even inhibiting altogether pain referred to the ear in cases of acute tonsillitis or a peri-tonsillar abscess, and sometimes in toothache. That, anyhow, could have nothing to do with the cortex.

Mr. Colledge had referred to the case which he, the speaker, had published in 1910, in which the sphenoidal sinus was involved. When he saw the boy he had had mild symptoms of influenza and was sitting up. Convinced that the pain was not due to the ear, he, Dr. Watson-Williams, guessed that its source lay in the sphenoidal sinus, and asked that he might see the patient again in a day or two if he did not get better. The pain, however, became so intense that it was thought that this diagnosis must have been at fault, and so others were consulted. This patient might have been saved if he had been allowed to explore the sphenoidal sinus.

The cases mentioned by Mr. Eric Watson-Williams showed that it was easy to slip the straight trocar and cannula into the sphenoidal sinus, even though there had been no previous opportunity of examining the nose. The contents could be sucked out, and if they happened to be purulent, not only had the diagnosis been made, but the tension in the sinus had been relieved and the patient was in a much safer state, seeing that tension was an important determinant as to the spread of infection from the sinus. Whenever a patient complained of pain in the ear for which no explanation could be found in the ear itself, the teeth and the nose should be examined. Even when there was trouble in the ear, examination of the nose by endo-rhinoscopy should never be omitted, otherwise one was very liable to miss the source of the pain and—more important—the source of the infection.

C. A. SCOTT RIDOUT said that the importance of the teeth in connection with referred pain should be emphasized. A short time ago a nurse at that hospital was constantly having pain which was referred to one ear. Repeated examination led to no discovery which would cause suspicion that the middle ear or the mastoid was diseased, but X-ray examination revealed an unerupted wisdom tooth, and after that had been removed there was no further pain.

Another case was that of a doctor who had some dermatitis of the right meatus, but with more severe pain than could be accounted for by an ordinary inflammatory condition of the skin. He, the speaker, failed to recognize the cause, but a month later X-ray examination revealed, in this case also, an unerupted right lower wisdom tooth, removal of which cleared up the pain.

One point which had not been stressed so far was that of an infected antrum. In a case of this kind he, the speaker, had not scored. It was in a female patient who had a discharge from the left ear and a good deal of pain. Although there was neither a raised temperature nor œdema of the mastoid, he had advised the mastoid operation. This she refused, and examination showed an acute inflammation of the antrum on the same side, causing the pain. Finding the same in other cases had led him to adopt the rule of always examining the nose.

Mr. Eric Watson-Williams had referred to cases of probably functional pain in the ear. There had been several cases at this hospital of severe pain referred to the ear, in neurotic people, usually women of about 30 years of age. He had had skiagrams taken in some of them, and some of the patients insisted on his opening the mastoid, and when that was done the mastoid was found to be of the cellular variety. He concluded that it was a functional pain probably due to a negative pressure in the cells, corresponding to what was known as a "vacuum frontal sinus." One patient, because of the continual pain, insisted upon operation, and he (Mr. Ridout) prophesied that she would want the other ear operated on within six months. The operation cured the pain, which was probably referred from a vacuum mastoid cell.

F. C. ORMEROD said he was impressed by Mr. Colledge's suggestion that referred pain was due to a mistaken localization by the cortex. He regarded this as a very good explanation as it fitted in with the referred pain which occurred in other parts of the body, such as pain felt in the shoulder due to trouble in the right side of the abdomen, and acute pain over the frontal sinus in deformity of the nose, accompanied by pressure between the nasal septum and turbinals. The cases he had seen were mostly those in which pain from disease of the throat was referred to the ear, particularly disease of the sinus pyriformis and tuberculosis of the larynx. In malignant cases pain was usually felt in the ear when the glands of the neck were involved. He had found that among tuberculous laryngeal cases, those in which pain was referred to the ear were the ones in which the ulceration was in the region of the innervation of the vagus nerve, rather than the glosso-pharyngeal. That gave an indication as to which cases were suitable for anæsthetization of the superior laryngeal nerve.

D. R. PATERSON said he would add one or two remarks chiefly from the historical point of view.

Thirty years ago he had been engaged, with Professor Francis Dixon, in a study of this question of the anastomosis between the glosso-pharyngeal nerve and the facial nerve and its clinical significance. Dixon had proved, by his embryological work, that the nerve of Jacobson appeared as an outgrowth from the petrous ganglion of the glosso-pharyngeal nerve, and that it accompanied a branch of the facial to supply the tympanum and other parts of the middle ear. In its distribution the glosso-pharyngeal had a large

number of terminal branches some of which supplied the tonsil and the tongue. Instances were collected which illustrated the importance and frequency of ear-pharynx pain. This question had an intensely practical aspect, because cases such as Mr. Colledge had quoted were not uncommon.

A further point was that a good number of tonsils were nowadays removed because of irritation occurring in that region, and cases were not infrequent in which the tonsil had been well removed and yet there remained definite discomfort, or even pain, in the ear afterwards, associated with hyperæsthesia of the tonsil bed, only yielding to suitable treatment of a general character.

C. de W. GIBB said there was one group of cases which it was difficult to explain on anatomical grounds. In three such cases the patient had only complained of pain in the frontal sinus and had chronic infection of the antrum on the other side. One of these had been brought by her doctor, who thought that the frontal sinus should be opened. She had had pain for a year, and the only sign of infection that he, the speaker, could find was in the antrum on the opposite side. Since that was treated she had been free from pain. He had since had two similar cases.

He emphasized the difficulty in cases in which there was something wrong with the ear. Three months ago he had seen a woman who had had intermittent pain in the right ear for eight years, and had a retracted drum and definite nerve deafness in that ear. He asked her about a suspicious-looking molar on the same side, and she said she had seen her dentist several times about it, and he said it was all right. Her doctor, however, insisted on having the molar extracted, and ever since the extraction she had remained free from pain.

L. COLLEDGE (in reply) said that the kind of pain referred to by Dr. Watson-Williams was *radiating* pain, rather than *referred* pain. His own meaning was pain which was not felt at the point of its origin, but was felt in the ear. Dr. Watson-Williams had not given any explanation as to how the cortex made this mistake.

DISCUSSION ON THE TYPES OF NASAL INFLAMMATION WHICH PRODUCE INFLAMMATORY CONDITIONS OF THE EAR.

Harold Barwell : This is an important subject, because if we know what nasal conditions are liable to cause aural inflammation, we may be able to protect our patients from a frequently serious complication. I shall limit myself to the frankly acute inflammatory affections.

Before trying to discover what types of inflammation in the nose are especially liable to produce inflammation in the ear, we should consider what are the paths by which the inflammation may extend from the one region to the other. Spread of inflammation by the lymphatics or by the blood-vessels is so rare that it need not be considered in this connection, although it is possible for the ear to be involved in the course of a septicæmia of nasal, as of any other, origin, but ordinarily the inflammation reaches the ear, either by continuity along the mucous membrane to and along the Eustachian tube, or by discharges from a septic focus in the nose being blown through the Eustachian tube into the tympanum, without involvement of the intermediate tract of mucous membrane. The latter is, I think, by far the commoner method.

There are, I suggest, three factors which may influence the extension of inflammation from the nose to the ear. They are (1) the situation of the nasal lesion, (2) the previous condition of the ear and the Eustachian tube, and (3) the virulence of the infecting micro-organisms.

(1) As to the situation of the nasal lesion, it is obvious that a furuncle at the anterior nares, or a septic condition of the vestibule, is unlikely to be followed by aural complications ; on the other hand, any inflammatory disease in the nasopharynx is liable to affect the ear. But we are limited to-day to diseases of the nose, not including the throat, and I do not find that suppuration in the posterior sinuses is

more frequently followed by aural inflammation than is that in the antrum ; indeed, the discharges from all the sinuses pass backwards into the nasopharynx and have equal access to the Eustachian tube.

(2) The condition of the ear, and especially of the Eustachian tube, is of importance in rendering the ear more susceptible to invasion. The short, wide Eustachian tube of children is a probable cause of their liability to aural complications, and increased susceptibility may be ascribed to the presence of adenoids or adhesions in the neighbourhood of the Eustachian orifices.

(3) I believe that the most important of these three factors is the virulence of the organisms causing the nasal inflammation. As well as general virulence, there seems also to be a quality in some strains of infection which has a special tendency to attack the ears, though I confess that such a statement rather begs the question than advances our knowledge. We are all familiar with epidemics, especially in schools, of measles and scarlet fever, in which there is a high incidence of aural complications, while in other epidemics, in other ways apparently not less severe, ear disease is much less frequent. Different epidemics of influenza behave in a similar manner, aural complications being particularly common in one and pulmonary complications in another. Professor C. C. Okell, in his illuminating Milroy Lectures of this year, supports the view that the different diseases—including scarlet fever—due to the hæmolytic streptococci are caused essentially by one species of streptococcus, diseases outwardly so unlike being accounted for by factors of varying susceptibility and varying virulence of the pyogenic property and erythrogenic toxin of the cocci. He quotes the recent work of Glover and Griffith to the effect that, when epidemics of influenza, severe common cold, measles, and tonsillitis occur in schools, there appears to be an exaltation of the epidemic activities of hæmolytic streptococci ; not only do such pyogenic affections as otitis and mastoid disease become common, but cases of scarlet fever may arise apparently *de novo*.

If, however, the most frequent method of infection of the ear from the nose is by discharges being blown through the Eustachian tube into the tympanum, it is obvious that this may occur wherever septic matter is in the neighbourhood of the Eustachian orifice. It is largely a question of violent or improper blowing of the nose. It is somewhat of the nature of an accident, and is analogous to the otitis which occurs after bathing, and it may be encouraged by washing out the nose or a nasal sinus, unless great care be taken. I am inclined to the opinion that this "accidental" happening is the most important factor of all in the production of inflammatory conditions of the ear from nasal inflammation.

T. H. Just. The subject of this discussion is so vast, that I propose only to deal with a few points, which I hope may help to make it of value.

Certain types of bacterial nasal infection are liable to cause inflammation in the ear. The *Streptococcus pyogenes* is by far the most common infecting organism of the ear. The pneumococcus is second, *B. influenzæ* and the staphylococcus third, and the rest are rare. Therefore it is obvious that acute nasal infections—usually mixed—in which the streptococcus occurs, are largely responsible for aural inflammation. Predominant pneumococcal infection of the nose is also a relatively common cause of severe infection of the ear.

It seems odd that severely infected noses, such as occur in atrophic rhinitis, with crusting, should so seldom give rise to any aural symptoms. In the same way, chronic suppuration of the antrum, whether of nasal or dental origin, is, in my experience, a rare cause of ear trouble. Chronic ethmoiditis with massive polyp formation comes into the same category. It therefore seems that virulence—and not heaviness—-of infection in the nose causes inflammation in the ear.

I want particularly to speak of sinus infection. As already said, chronic antrum and ethmoid infection *per se* are rare causes. Frontal sinusitis, undoubtedly from

its position, is still rarer ; overlooked sphenoidal suppuration may sometimes cause chronic suppuration in the ear.

Turning to acute sinus infection, an otitis media occurring simultaneously with a homolateral antrum infection nearly always ends in an acute mastoid infection.   The acute ethmoid is less virulent from the ear point of view.   These two acute conditions obtain under ordinary conditions, the sinus and the ear being infected simultaneously.

I have no doubt you have all experienced during the past five months, cases of sinusitis, especially infection of the antrum, which have occurred during the influenza epidemic.   In my experience, unless dealt with as conservatively as possible, these have given rise to an acute otitis media which was not present before operation on the sinus and in most cases fails to clear up, so that the mastoid needs draining.   I should be grateful for guidance in dealing with these cases, as they have been a real source of anxiety during the last few months.

T. B. Layton said that of the large subject before them that day he proposed to speak only of acute osteomyelitis of the mastoid bone, due to the hæmolytic streptococcus.   The striking factor of that affection was its protean nature.   It varied from a subacute infection, absolutely symptomless, in which the diagnosis could only be made by inference, to an infection as devastating as any that occurred within the human body.   There were three possible explanations of this variation, either in the virulence of the invading organism or in the resistance of the individual, or in a " tertium quid."   While making every allowance for the effect of the first two, he did not think this effect would explain all the variabilities of the disease.   He felt that there must be a " tertium quid " and wished to put forward as a basis of discussion the suggestion that this would be found in the second organism in the upper respiratory tract.   With this in his mind he had drawn up the following list.

A Classification of Infections of or through the Upper Respiratory Tract, according to the Liability of the Patient to develop an Osteomyelitis of the Mastoid Bone due to the Hæmolytic Streptococcus.

(*A*) *Infections by Bacteria* :

    (*a*) In which mastoiditis does *not* occur.

                    Cerebrospinal meningitis.
                    Whooping-cough.
                    Rheumatic fever.

    (*b*) In which mastoiditis does occur, but the organism causing the infection is different from that causing the mastoiditis.

                    Diphtheria.
                    [Common cold.]
                    [Influenza.]

    (*c*) In which mastoiditis does occur and the organism causing the infection is the same as that causing the mastoiditis.

                  Scarlet fever.
                  Follicular tonsillitis.
                  Acute septic inflammation of the throat.

    [(*d*) In which mastoiditis does occur and the organism causing the infection is closely allied to that causing the mastoiditis.]

                  [Scarlet fever.]

(B) *Infections by filterable viruses* :

(a) In which mastoiditis does *not* occur.

Acute anterior poliomyelitis.
Encephalitis lethargica.
Smallpox.

(b) In which mastoiditis does occur.

Common cold.
Measles.
[Influenza.]

NOTE.—The above list, to the completeness of which the compiler lays no claim, is submitted as a basis of discussion. It contains many debatable statements. An attempt has been made to indicate some of these by brackets. Thus, the sub-section (A) (d) has no place for those who hold the "unitarian" view of the streptococci (Okell, *Lancet*, 1932 (i), 867), and influenza is included in (A) (b) for those who hold that *B. influenzæ* (Pfeiffer's bacillus) is the causative organism of this infection. There may be some who will not yet accept that the common cold is caused by a virus (Dochez, Mills and .Kneeland, *Lancet*, 1931 (ii), 547). Other statements are equally debatable ; thus, it has been said that "it is impossible at the present moment to find any criterion that we can apply to enable us to distinguish between two possibilities, viz. : (1) that a virus behaves like a bacillus and (2) that it behaves like a growth-promoting substance " (Boycott, A. E., 1929, *Proc. Roy. Soc.*, B. 104, 560, quoted in *Med. Res. Council Bact.*, vii, 17), and it may, therefore, be premature to speak of infections by filterable viruses.

In considering this list, one striking thing would be noticed. The diseases in which mastoiditis did not occur (Class *a*) were also those in which there was no reaction in the upper respiratory tract. They might be described as infections *through* rather than *of* this area. The dividing line between the class with mastoid complications and without corresponded absolutely with that between the infections of the upper respiratory tract and the infections through it.

In diphtheria mastoid disease was not remarkable, though, when it occurred, the diphtheria was the important factor rather than the disease of the bone. In scarlet fever also might be seen striking examples of symptomless mastoiditis. It was in influenza that they were faced with such grave anxiety, and it was the same with measles once the petro-mastoid suture was closed. In the infant with measles the vulnerable tissue was the mucous membrane of the bronchioles, and if the ear was affected the inflammation spread out through this suture so that a snick could be made into the resultant swelling until such time as the condition of the lungs warranted a major operation. In the older child and adult the mucous membrane of the lungs was no longer so vulnerable and the suture across the mastoid antrum was closed, and in such patients an osteomyelitis of the mastoid bone in measles was quite as dangerous as it was in influenza.

Passing to sequences of infections, the seriousness of the local disease was still more striking. One such sequence was measles on the top of scarlet fever, which he thought was more serious than scarlet fever as a complication of measles. It was certainly a very serious matter for a child to develop mastoiditis in the course of an attack of measles following scarlet fever in which otitis media had arisen ; but in his experience the most dreaded sequence was for scarlet fever to arise in a case of influenza in which the ear was involved. In the two cases which he had seen the patients had quickly died. (*Guy's Hospital Reports*, 1931, p. 82, cases 35 and 36.)

With these things in the mind let them return to cases of acute follicular tonsillitis and allied conditions. In these the osteomyelitis of the mastoid process

bore no relation to the severity of the primary infection. One did not often see it either in an acute tonsillitis or an acute septic sore throat, and if one did it was not necessarily a virulent type of mastoiditis. On the other hand, a severe form of mastoiditis might arise with very little change in other parts of the upper respiratory tract. He thought there was some reason to suspect that the association of a common cold was the determining factor in the severity of the disease. He would not put this forward as proven, but asked Members to observe and consider the point.

If this suspicion should prove correct, there was the striking fact that the three diseases—common cold, influenza and measles—in which invasion of the mastoid by the hæmolytic streptococcus was particularly severe, were each caused by an ultra-microscopic body.

He suggested that the factor determining the severity of an osteomyelitis of the mastoid process, due to the hæmolytic streptococcus, was the presence of a second organism, and believed that this would prove in the majority of cases to be a filterable virus.

A. Lowndes Yates said that there were not only two main types of infection, but two main clinical types, the leucocytic and the serous. Most of the cases of sinusitis seen when they were established were of the leucocytic type. But frequently cases of influenzal infection of the nose recovered satisfactorily, leaving a chronic infection in the ear. The reason of that was that the infected tract which was in the ear was not sufficiently large to create immunity, and so the cases proceeded to chronic deafness. Nothing could be found wrong with the nose because it had completely recovered. That was of great importance, because aspiration with the tube would cure early cases, and was not sufficiently practised in this country. A vacuum was caused in the nose, and that vacuum sucked in the tympanic membrane. The result was immediate, because a patient who had been unable to hear, at once heard well, and often retained the hearing. The contents contained scarcely any leucocytes, but epithelial cells were found, and that was characteristic of the serous type of infection. The more chronic cases, in which the infection was not of such great degree, showed a nasal mucous membrane recovered, but in these cases the ear "would go deaf" from thickening of the membrane.

The Nasal Air-way in the Newborn Child. Demonstration of Model.

By Gavin Livingstone.

Specimens of stillborn fœtal noses varying in age from five months to full term were obtained from different sources. It was difficult to get noses of children at post-mortem examinations because of the mutilation necessitated. The specimens have been investigated in various ways : some have been decalcified and embedded in celloidin and cut into serial sections ; others have been dissected (macroscopically) to show the state of the turbinates and paranasal sinus.

No physiological experiments have been, so far, carried out on animals, but such experiments may be undertaken at a later period.

A model has been reconstructed with a 12·5 magnification. The method employed was the usual one for serial reconstruction but briefly the steps were as follows : First the sections were projected on sheets of paper, so that the images were magnified to the required amount, which depended on the thickness of the sections. The images were traced by hand and then rolled on sheets of wax one millimetre

thick, that is 1,000 µ thick. These sections were cut at 40 µ and each alternative section was traced. This is the same as taking each section and calling it 80 µ. A section of 80 µ thickness has to be multiplied by 12·5 to make it a 1,000 µ thick. This was the reason for choosing 12·5 magnification.

The tracings on the wax sheets were placed on a flat surface and cavities cut out. The series of sheets were superimposed and an accurate reconstruction resulted. Any measurement of volume, size, or shape, in the fœtus can be readily calculated from similar measurements of the model. The air-spaces in the nose have also been reconstructed and the volume of the air-channels and paranasal sinus has been measured.

The model has been halved, the septum removed and a portion of the middle turbinal cut away from one side, but it still forms an accurate basis for examining the air-channels.

The inferior turbinal is well developed but is close to the lateral wall, and the anterior end does not project into the lumen, and thus guides air into the inferior meatus which is small. For the purpose of description, the middle turbinal has two portions, an ascending limb and a horizontal limb: the ascending portion stands out from the lateral wall and projects boldly into the cavity; the horizontal portion is closer to the lateral wall. Thus the middle meatus is long and funnel-shaped. The superior turbinal is developed behind this upward turn of the middle turbinal and is flat, with no projection, sloping gently to the posterior choana. The supreme turbinal in this case is well developed and projects into the olfactory channel.

From this arrangement on the lateral wall the inspired air has the choice of two main channels. The first and the more important is through the middle meatus. The projecting middle turbinal with its ascending free border deflects the air to where it must pass over the uncinate process, the hiatus semilunaris and the poorly developed ethmoidal bulla. These irregularities set up currents and eddies which delay the air and allow it to reach the infundibulum and the air-cells which drain into it. During this delay the air undergoes the physiological modifications which are so important; it becomes moistened by the mucosa and it is warmed by the plentiful supply of blood-vessels.

The other channel is above the middle and superior turbinals. The inspired air impinges on the roof of the nose, the supreme turbinal, and the spheno-ethmoidal recess, which tend to turn it back. A circular motion is set up which causes delay and allows the olfactory mucosa to be stimulated.

The vestibule and the antrum of the middle meatus seem to be larger in proportion in the child than in the adult, and thus more air passes by the olfactory channel. This may account for the statement that the sense of smell in a child is more acute than in an adult. Very little air goes by the superior meatus, which is small and narrow, but rich in olfactory mucosa.

The olfactory area has often been mapped out; it is limited to a small area on the upper one-third of the septum, the superior turbinal and a small portion of the middle turbinal. By means of the serial sections it is possible to mark out the transition from olfactory to respiratory mucosa. Athough it is not always sudden it is usually quite definite. Occasional islands of olfactory cells are separated from the recognized area by respiratory epithelium. I have not yet finished plotting the area, but it appears in this case to extend further than is stated by Brum or Read. [Two slides illustrating the transition between the two types of epithelium, one from a guinea-pig, the other human, were shown.]

The cast of the infundibulum shows that it is quite a large chamber with the anterior and middle ethmoidal cells budding off, but as yet not very big. Both the uncinate process and the ethmoidal bulla are poorly developed, although they contain cells. When they are fully developed they may obstruct the middle meatus, deflect the air-current, and thus cause further delay.

The maxillary antrum is small, being further developed on one side than on the other.   On the right side it is triangular in coronal section and extends about one centimetre in length.   The lining is columnar ciliated epithelium but of a more simple type than that of the nasal mucosa.   There are fewer glands and there is less erectile tissue.   The floor of the antrum is above the level of the floor of the nose and the external wall is nearer the mid-line than the supraorbital nerve; in the adult the reverse is the case.

On the left there is no lumen to be seen.   The two layers of mucosa are in apposition but the actual length and depth are the same as in the right maxillary antrum.   It was impossible to show this on the model.   This inequality is common and the state of the development varies in the full-time fœtus.

In several specimens there has been marked congestion.   The venules and capillaries were engorged, extravasation of blood having taken place between the cells.   The mucosa had been lifted away from the glandular layer, and the lumen of the nose was filled with epithelial cells and débris.   This shedding of epithelium may be an artefact, but all the specimens have been prepared in a similar manner, and only those showing extreme congestion show the shedding of mucosa.   This congestion is more marked in the upper parts of the nose, in those parts which are drained by the ethmoid veins to the ophthalmic and into the cranial cavity.

Obstructed labour and any factors which will cause increased intracranial pressure have a deleterious effect on the nasal mucosa, especially the olfactory mucosa, which has no definite basement membrane and is more delicate than the respiratory mucosa.

Further specimens of the noses of babies who have died during, or shortly after, birth, from blue asphyxia, excessive moulding and, in one case, ruptured tentorium cerebelli, are being prepared in celloidin at the Ferens Institute.   When these are cut they will demonstrate more clearly this congestion and injury to the mucosa.

V. E. NEGUS said that he had been associated with Mr. Livingstone in his work at King's College Hospital. The models were of the greatest value ; it was difficult to show small details without an enlarged model, but only those who tried to make models on so large a scale could appreciate the labour involved. It was surprising that the olfactory mucous membrane had not been found to be more extensive. In some monkeys and many lemurs the turbinals were convoluted, and the scent of those animals was well developed ; they had an epiglottis shutting off the mouth from the air stream, so that inspiration must take place through the nose. In the chimpanzee, the orang, and the gorilla, the acuteness of smell was less, and the epiglottiis did not shut off the mouth. If the younger fœtus were investigated it would show a convolution of the superior turbinals, and a much wider distribution of olfactory mucosa.

Cinematograph Demonstration and Specimen of Retrosternal Carcinoma of the Thyroid Gland.

By J. R. B. HERN.

Patient, male, aged 53.   History of twelve months' progressive cough and, recently, increasingly urgent dyspnœa and orthopnœa.   The cough was typically brassy, and other features, on examination, were deviation of the larynx about half an inch to the right, and engorgement of both jugular veins, especially the right. There was no swelling to be seen or felt above the clavicle, and in the chest there were no signs except trifling impairment of the note over the manubrium sterni and alteration of breath-sounds near the inner end of the right clavicle, suggesting considerable deviation of the trachea to that side.   The heart was slightly enlarged to the left, raising the suspicion of an aneurysm.

A skiagram showed a well-defined non-pulsating mass high in the superior mediastinum, with displacement of the trachea to the right and forwards, and of the œsophagus to the right and backwards.

Bronchoscopy under cocaine showed the larynx and hypopharynx deeply

engorged, the laryngeal movements normal, and the trachea lower down stenosed by lateral pressure. The Wassermann reaction was negative.

After a single dose of deep X-ray treatment at Guy's Hospital, the patient began to cough a large lump into the left supraclavicular fossa. At the end of each paroxysm the act of inspiration sucked the lump back again beneath the sternum. The moving picture showed this plunging action followed by the more important steps in the operative removal of the tumour by Mr. E. G. Slesinger (the owner of the film, by whose kind permission it was shown). The cinematography was carried out by Mr. R. C. Brock.

Removal was undertaken as there was now evidently a thyroid tumour, possibly benign, but rapidly asphyxiating the patient. The entire left lobe was taken from beneath the manubrium, and microscopic examination showed it to be malignant. The patient was progressing well in convalescence, but ten days after operation right-sided pleurisy developed, followed by a streptococcal empyema, and he died. At post-mortem examination the rest of the gland and the adjacent lymph glands were found to be malignant. There were no distant metastases.

The complete diagnosis was apparently carcinoma in a congenitally misplaced thyroid gland—a rare type of so-called " substernal thyroid."

HERBERT TILLEY said that the case reminded him of a middle-aged woman, whom he saw many years ago. She complained of hoarseness and slight stridor, and the left vocal cord was paralysed. On pressing his fingers deeply behind the upper borders of the sternum he felt a firm, dome-like structure. Screening of the chest showed a large oval shadow behind the sternum. The patient was sent to Sir James Berry, who removed a dermoid cyst from behind the sternum. The patient recovered from the pressure symptom, but the vocal cord remained *in statu quo.*

CASES.

C. A. SCOTT RIDOUT.

I. Otological.

Cerebellar Abscess after Twelve Years.

F. T., aged 30, female. Admitted to hospital December 16, 1919.

Temperature $100 \cdot 8°$, pulse 90. Complains of pain in head. Left otorrhœa on and off for some years. Has vomited continually since December 14. Loss of power down left side.

Operation, December 16.—Left mastoidectomy. Mastoid infected and pus present in antrum.

Progress.—Improved for a few days, then had severe vertigo, vomiting, and headache. Pulse 46, temperature subnormal; almost complete left facial paralysis.

Second operation, December 24, 1919.—Wound opened up. Very foul cerebellar abscess discovered deep to fragment of necrosed bone at lower posterior angle of mastoid antrum; 2 to 3 oz. very fœtid pus evacuated. Modified Carrel-Dakin treatment carried out. Patient made steady uneventful recovery.

May, 1932.—Is in good health. Facial paralysis has, to a considerable extent, diminished but some weakness remains.

Cerebellar Abscess after Ten Years.

F. L., male, seen May 3, 1922, then aged 8 years.

Had been ill two weeks; pain left ear; no otorrhœa. General headache; vomiting; left mastoid tender. Temperature 98°, pulse 60.

May 5.—Still headache; vomited several times; pupils unequal; complained of vertigo.

Operation.—Left mastoidectomy. Extensive extradural abscess found tracking back about 2 in. when a large rent in the dura was found to communicate with an extensive cerebellar abscess. Drained; modified Carrel-Dakin treatment carried out.

The mastoid cells appeared only slightly affected and there was no pus in the mastoid antrum but only some mucus. Left facial paralysis followed operation. No further vertigo or headache. Pus grew streptococci. No further vomiting. Tube removed after ten days.

July 12, 1922.—Renewed vomiting every morning reported.

August 18, 1922.—Recurrent cerebellar abscess, incised and drained. Good recovery. Subsequently hernia cerebelli developed, protruding as a granulomatous mass; dressed with rectified spirit.

May, 1932.—Patient, now aged 18, has developed well, can hear loud sounds in left ear but cannot distinguish words. Cerebellar hernia very small. Slight facial weakness present.

Discussion.—T. H. JUST said that before Professor Neumann gave his address to the Section of Otology[1] he, the speaker, had not realized how horrible the result of operation for cerebellar abscess was, and it was encouraging to see two people who had had the disease— but were well so many years after the operation. Except for a slight error in pointing, the woman was now a normal person. Apparently, when the abscess was present there were no very definite cerebellar symptoms. Cortical cerebellar lesions, unless affecting the basal nuclei, or the dentate nucleus, gave no recognized cerebellar symptoms.

As to the approach through the ear, naturally otologists opened brain abscess through the source and channel of infection, but there still remained some surgeons who preferred to operate through the clean uninfected brain; he had seen cases opened by a large occipital decompression, the ear condition being left untouched. An appalling hernia was left, which would not clear up as long as a septic focus remained in the patient's ear. There was danger of infecting the brain by going through clean brain tissue, as there was no inflammatory barrier thrown up in the surrounding tissue by a septic focus in the mastoid. The mastoid route was not only the easiest way to find the abscess, but the terminal results were good, as the patient got a hard scar, without any soft place being left in the skull.

J. W. HARRISON (Newcastle) said that the greatest difficulty in these cases was the drainage. Tubes did not usually work satisfactorily. Recently he had tried the packing of the cavity with bipp gauze. It was as yet too early to say whether it was a better method or not. One patient had been going on well for ten days, and then he, the speaker, tried to hasten matters by putting in a tube and leaving out the packing. Then the temperature ran up, cerebritis developed and the patient died. In another case a small child had had an abscess packed three weeks, and did well. A tube was then put in, and that case also went wrong and the child died.

A. LOWNDES YATES said that the question of the method of drainage was of great importance. Some otologists in America held that drainage should be by cones of silver filigree or by tubes, while others said that it was the drainage which caused the damage to the brain which killed the patient. The latter contention had led to an interesting series of cases in the United States, in which the abscess cavity was not drained but aspirated at repeated intervals by a small blunt needle. The results were claimed to be better than those by drainage.

The experiment of any one observer was too small to warrant any definite conclusions, but there seemed to be a type of case in which drainage might do harm and aspiration of the abscess would be the best form of treatment, while there were others in which drainage would give the best results.

II. Laryngological.

Multiple Papillomata of Larynx.

W. S., aged 25, male, engineer.

First seen in 1915, when three papillomata were present, two on the right and one on the left vocal cord. Treated with cautery.

December 8, 1925.—Condition more advanced, four distinct papillomata present, one growing from superior ventricular band on left side and overlapping true cords, and one from base of epiglottis. Voice very husky.

[1] *Proceedings*, 1930, xxiii, 1045 (Sect. Otol. 41).

December 15, 1925.—Papilloma removed by direct laryngoscopy.

January 1926.—Further portion of growth removed.

January 22, 1926.—Another papilloma removed (local anæsthesia, indirect method), and again on February 14, March 14, and September 26.

November 10, 1926.—Voice much stronger.

November 6, 1927.—Papilloma removed from epiglottis, and portion of right vocal cord punched out with a papilloma attached.

January, 1928.—Small recurrence on left false cord.

November, 1929.—Papilloma removed from anterior commissure.

April, 1932.—Still multiple nodules but good voice and general development.

Recurring Papilloma of Larynx.

A. W. E., aged 8, male.

First seen October 12, 1927, on account of aphonia and laryngeal obstruction.

October 14, 1927.—Tracheotomy. Removal of large sessile papilloma almost occluding glottis. Pathological report—papilloma.

November 11, 1927.—Tonsillectomy and removal of adenoids. Discharged, much improved.

June 27, 1928.—Dyspnœa following a " cold," immediate tracheotomy.

July 3, 1928.—Papillomatous growth removed from vocal cords. Tracheotomy tube kept in for four months.

January 9, 1929.—Better voice returning.

April 24, 1929.—Some recurrence of papilloma on right cord.

March 26, 1930.—Respiratory difficulty. Tracheotomy. Large papillomatous mass removed from right vocal cord. Rubber tracheotomy tube kept in for several months, in spite of which a further papilloma was removed from glottis and subglottic region October 3, 1930, and base cauterized with chromic acid. Improved for several months, but on November 3, 1931, a further papilloma was removed.

April 13, 1932.—Much improved, cords seem clear. A small permanent tracheotomy fistula is present.

HERBERT TILLEY said that in the second case there was a congested sessile type of papilloma which could be removed by the direct method without much difficulty. In such cases one could get a better result if the surface from which the growth was removed was dried and then painted lightly with glacial acetic acid. In one or two cases so dealt with there had been freedom from recurrence for a longer period than he had formerly experienced. He referred to a little boy whose mother stated that forty-seven operations for recurrent papillomata of the larynx had been performed before they finally ceased to reappear.

Lambert Lack had a similar experience with a little boy on whom many operations were performed in Golden Square. Children especially seemed to suffer from multiple growths and they were likely to recur after removal. On the other hand, it was common experience that they eventually ceased to appear and therefore drastic measures should not be employed for dealing with the condition.

Squamous-celled Carcinoma of Naso-Pharynx treated by Radium.

Mrs. K. H.

History.—Increasing sense of obstruction at back of nose ; able to breathe through one nostril only.

Examination, April 25, 1932.—Patient looked pale and ill. A large soft polypoid growth occupied almost the whole of the nasopharynx, and bled freely on examination. Piece of growth excised proved to be squamous-celled carcinoma.

Treatment, May 2.—25 mgm. tube of radium inserted through right nostril into growth for 72 hours. This was repeated on May 5 through the left nostril also for 72 hours.

May 19. Patient much improved ; growth distinctly less. Able to breathe through either nostril.

Tuberculosis of Mouth.

Male, aged 18.

Disease first noticed in nose at age of 4 years. Subsequently affected gum of upper jaw in region of incisor teeth. Has spread over roof of mouth and soft and hard palate. Senses of smell and hearing are both impaired.

Had radium treatment for nose and gums seven years ago with unsatisfactory results. Eighteen months ago treatment with sanocrysin was begun.

F. C. ORMEROD said he thought that this was a more active type of ulceration than lupus. There was a distinct loss of tissue in the upper jaw, which had been treated by radium, and also by sanocrysin. Sanocrysin usually aggravated tuberculous disease in the upper respiratory tract and larynx, and might, in this case, have kept the process going. The better course seemed to be surgical treatment of the jaw, followed by diathermy.

Destruction of Nose and Part of Face by Squamous-celled Carcinoma of Rodent Ulcer Type.

F. S., aged 60, male.

November, 1926. Ulcer the size of a florin on right ala nasi—exposing septum —excised and edges fulgurated by diathermy.

Patient was admitted on several occasions during 1926-1931 for diathermy for small recurrences, resulting in total destruction of nasal bones and external nose.

August 4, 1931.—There being no evidence of recurrence, and the edges of the destroyed area appearing healthy, a pedicle graft containing a portion of rib cartilage was formed on the upper part of the chest, with a view to re-making a nose. This was moved upwards at fortnightly intervals until it reached the left cheek in March, 1932, but no further progress could be made as recurrence of the growth had taken place—with increasing destruction towards the left eye—in spite of further diathermy.

Discussion.—F. J. CLEMINSON said this case was similar to one which he had had ten years ago, which was marked by the relentless march of the disease, involving the nasal bone, the ethmoids, and eventually the orbit, so that a series of operations had to be carried out at different times, at one of which, with the co-operation of Mr. Affleck Greeves, the eye was removed, together with the floor of the orbit, the inner wall of the antrum, and the rest of the ethmoid. Later the disease spread towards the roof of the skull and attacked the frontal sinus and the floor of the anterior cerebral fossa. During operation the dura was opened and a small amount of cerebrospinal fluid escaped ; the opening was packed with flavin and closed in ten days. Then the patient seemed free from disease for a time, but later there was a further recurrence ; he had not been seen recently and it was feared that he was now dead. The manifestation in this case was purely local ; there was no glandular involvement at any stage. He, the speaker, regarded the outlook in such cases as hopeless.

J. F. O'MALLEY said that in the previous year he had had a case of extensive rodent ulcer involving the cartilage of the ear and the side of the face as far as the angle of the jaw. Though the region permitted of an extensive incision, the result was poor. Later he buried a number of lightly charged radium needles in the surrounding sound tissue and on the floor of the ulcer, and there was complete healing. If that had been done in the present case, when the disease was restricted to the ala of the nose, the extension might have been prevented.

Œsophageal Pouch removed by Operation.

F. H., aged 60, female.

History.—Dysphagia for one year. Food returned up to twenty-four hours after swallowing.

Radiograph (shown) shows well-marked œsophageal pouch on left side about level of fourth dorsal vertebra.

Examination.—June 26, 1930. Œsophagoscopy showed well-marked opening of pouch into œsophagus, the normal lumen of œsophagus being reduced to a small anterior slit. On manipulation the œsophagoscope passed into this quite easily.

Gastrostomy was then performed.

July 5, 1930.—Pouch removed by external operation, œsophagoscope being first passed into the pouch and held in position by an assistant. This enabled the pouch to be easily defined, dissected up, ligatured at base, divided with cautery and buried into œsophageal wall.

July 24, 1930.—Œsophagoscopy showed normal œsophageal lumen; dimpled scar seen at site of pouch; gastrostomy allowed to close.

Discussion.—W. G. HOWARTH said this case also was a credit to Mr. Ridout, as the woman was free from any symptoms, and was likely to remain so. The skiagram was typical, and the œsophagoscopic appearance showed a large opening into the pouch. He noted that Mr. Ridout removed the pouch at one operation, but he, the speaker, preferred a two-stage one—in the first, finding the pouch and slinging it up towards the mastoid, so as to bring the depending hole uppermost, and packing round the neck of the pouch with gauze; in the second, exposing the pouch and dissecting the muscular layer from the mucous layer, turning it in, like an appendix stump, and cutting it off. This operation had been well described by Ivor Back and Lionel Colledge many years ago and was most satisfactory.

L. COLLEDGE said that gastrostomy was not really necessary as the patients were able to swallow freely immediately after the first stage of the two-stage operation mentioned by Mr. Howarth.

HERBERT TILLEY said he had only met with one case in which malignant disease had developed in a pharyngeal pouch, but that it was not a rare complication was evident from the number of cases recorded in French and American literature.

C. A. SCOTT RIDOUT (in reply) said that the patient had been starving and her condition had improved greatly after the preliminary gastrostomy. It was difficult to see how any food could possibly pass down the ordinary.channel. Knowing that in these cases suppuration was sure to take place, he had not closed the wound entirely. The pouch had been easily removed. The patient merely took sips of iodized water afterwards, and the wound had healed completely within twelve days. He preferred the one-stage operation with absence of granulation tissue.

FURTHER REPORT ON CASES PREVIOUSLY SHOWN.

Papillomatous Condition of Vocal Cord.[1]

E. M., aged 49, female. Shown November 7, 1930.

November 25, 1930.—Following advice of Members of the Section, laryngo-fissure was performed and right cord extensively removed.

Pathological report. No evidence of malignancy [section shown].

A new vocal cord re-formed and also one isolated papilloma, which was noticed on March 25, 1931, but apparently dropped off shortly afterwards.

May, 1932.—Functional result good. Movements of re-formed cord good.

Discussion.—WALTER HOWARTH said these cases varied in their tendency to recurrence. The most trying were those in which there was a multiple papillomatosis, extending on to the pharyngeal wall, especially when they spread to the trachea below the tracheotomy wound. A patient under the late Mr. Beetham Robinson underwent about sixty operations for such a condition, and died because there was a mass above the bifurcation of the bronchi. Nothing was better than removal and touching the base with acid; probably the best was trichloracetic—monochloracetic being too penetrating. The man's voice might have been improved by removing the papilloma of the right cord. The woman's pedunculated papilloma might also be removed by the direct method, with considerable advantage, and in that case preliminary laryngotomy would be a help. This procedure had suffered rather an undeserved eclipse.

The case last shown was very remarkable, as there seemed to be a good vocal cord on that side having perfect movement; one would not think that the cord had been removed. He congratulated Mr. Ridout on his success.

1 *Proceedings,* 1931, xxiv, 308 (Sect. Laryng. 8).

T. B. JOBSON said that in a case of sessile papillomata he had tried a flat electrode applied to one cord for diathermy treatment, switching the current on and off. After three applications the patient did very well. There was no reaction and no œdema, nor was there any respiratory difficulty after the operation. The voice was greatly improved.

C. A. SCOTT RIDOUT (in reply) said the case about which he was anxious was that of the little boy, who had been under treatment for five years. He still hoped that this child would outgrow the papillomata. There was a little permanent fistula, which he regarded as a safety-valve, in case of dyspnœa. With regard to the case of large recurrent papilloma, he had not seen the patient during ten years.

Tuberculosis of Nasal Bones.[1]

E. T., aged 51, tramway man.

There is a clean, permanent deficiency in the bridge of the nose and a granulomatous condition is still seen intranasally. General health good.

During the past eight years and a half he has had an open-air job with no special treatment except an oily nasal paint containing thymol and creosote.

Complete Occlusion of Posterior Choanæ (Congenital), treated by Operation.[2]

L. G. C., aged 20, male.

Operation (November 23, 1928).—Right and left posterior choanæ made patent. Occlusion found to be mainly membranous, but posterior portion of vomer was removed and also portion of posterior edge of hard palate.

April 20, 1932.—Has developed well since and can run much better (was before operation accustomed to long distance running). Sense of smell not greatly improved. Intranasal appearances now normal. Posterior choanal openings functioning well.
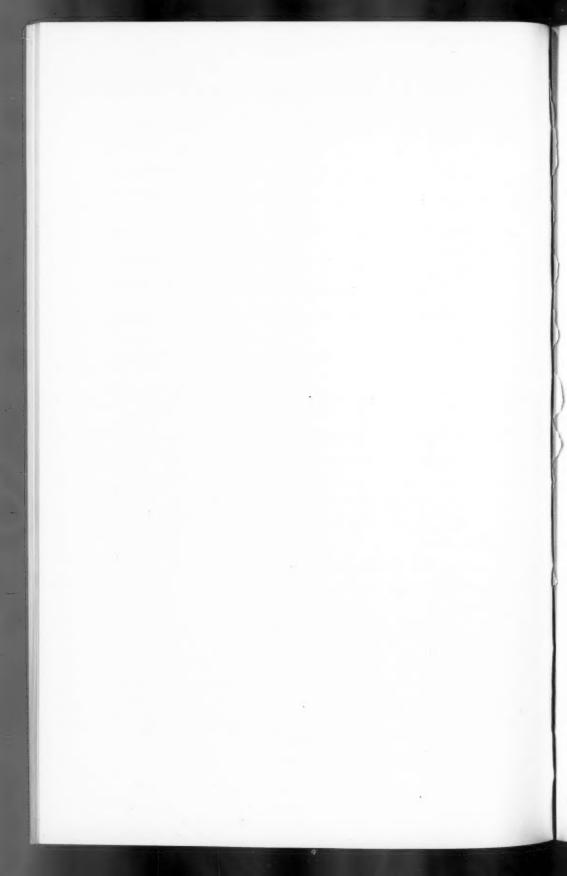
Functional Dysphonia. (Abnormal Voice.)—E. COWPER TAMPLIN.

E. W., a boy, aged 15. Is said to have spoken quite naturally until about two years ago, when there gradually appeared the faint high voice and slight lifting of the head now present. The boy is normally developed and nothing abnormal has been found in the larynx.

F. C. CAPPS said he thought that the tonsils were enlarged. If one held the head down and prevented the boy from raising his larynx under his tongue, he produced a normal voice, and also for a short time after letting the head and larynx go; then he produced a falsetto voice again. Re-education of the voice should be tried before any decision was made with regard to operation.

1 *Proceedings*, 1924, xvii (Sect. Laryng. 13).
2 *Ibid.*, 1928, xxii, 159 (Sect. Laryng. 3).

Section of Urology.

President—Mr. A. RALPH THOMPSON, Ch.M.

[*June* 23, 1932.]

Some Changes and Problems in Urology.

By Sir JOHN THOMSON-WALKER, F.R.C.S.

UROLOGY as we know it to-day commenced with the invention by Nitze [1] of his indirect cystoscope in 1887. Nitze's first attempt was made in 1877. The source of light was a naked platinum wire in a small glass tube. A bird's quill surrounded this and formed the window of the lantern, and a cumbersome water-cooling circulation operated between these. It was not until the introduction of the incandescent electric lamp that the instrument on which the present cystoscopes are modelled was constructed.

We owe the development of cystoscopic work in this country to the energy and imagination of Mr. E. Hurry Fenwick [2]. The next step was the separation of the urine of each kidney. Newman, of Glasgow [3], was the first (1883) to catheterize the ureters under the electric light. He introduced a small incandescent lamp on a long fine stem into the fluid-distended bladder, and followed this by passing a speculum with a closed glass end. He could see the ureteric openings and passed a fine catheter outside the speculum into them. The catheterizing cystoscope was developed by Brenner, Tilden Brown, Nitze, Cooper and Albarran.

In 1895 Roentgen [4] published his discovery of X-rays. In the following year Dr. John MacIntyre [5], in the Glasgow Royal Infirmary, produced the first plate showing an X-ray shadow of a stone in the kidney, and this was removed by Mr. David Newman. This was the first connection between the X-rays and urology.

Progress in cystoscopy and in radiology of the urinary tract was at first slow. Dr. Lester Leonard [6] in Philadelphia, and Dr. Thurstan Holland [7] in this country, did pioneer work in establishing radiology on a sound basis, and then followed ureterography (Tuffier, 1897, Fenwick, 1905); pyelography (Voelcker and Lichtenberg, 1906); cystography (Blum, 1920); urethrography (Cunningham, 1910); lateral radiography (Knox and Thomson-Walker, 1923); intravenous pyelography (von Lichtenberg, 1929).

Estimation of the renal function by means of special tests was the third great step in diagnosis in urology. The first systematic work was published by Achard and Castaigne [8], and Guyon and Albarran [9] applied this to the comparative function of each kidney in 1897. An immense volume of valuable work followed, but only a few of the many tests have survived. Of these may be mentioned indigo-carmine (Voelcker and Joseph, 1903); phenolphthalein (Geraghty

and Rowntree, 1909), and the urea-concentration test of Maclean and Wesselow (1921), combined with blood-urea estimation.

These three lines of investigation—namely, cystoscopy, X-ray examination and the estimation of the renal function—form the basis on which modern work in urology is founded.

The disappearance of the exploratory operation.—One of the earliest and most sweeping changes that resulted from the use of these methods was the disappearance of the exploratory operation. Sometimes, however, even to-day we must resort to an open operation for the diagnosis of some symptom such as hæmaturia. When such an operation discovers no cause for the symptom, gives no guarantee that it will not continue or recur, and is followed, as it may well be, by a period of anxiety, owing to the continuation of serious hæmorrhage and the possibility of a secondary nephrectomy, one begins to realize that exploratory nephrotomy is an uncertain—and sometimes a dangerous—method of diagnosis. Such operations were the common means of diagnosis before the development of our modern methods of investigation.

The able and lucid Hunterian Lectures delivered by Henry Morris [10], in 1898, are a mine of information in regard to the views and practice at that time.

In the figures which Morris gives there were 180 operations for kidney stone, and in forty-two cases no stone was found. Thus in $23 \cdot 3\%$ the exploratory operation was negative. And further, these operations for stone were only performed after the patients had suffered from symptoms for an average of $11 \cdot 8$ years.

When we compare these figures with the certainty with which we now diagnose kidney stone before operation, the numbers of patients that are spared operation by cystoscopic manipulation, the early and accurate removal of stones and the resulting conservation of kidney tissue at the present day, we have some measure of the progress that has been made in renal surgery since these valuable statistics were published.

Exploration of the bladder by introducing the finger through a small suprapubic or perineal incision, or through the forcibly dilated female urethra, was a common method of examination before the cystoscope came into general use. As a means of diagnosis for any disease except stone and advanced growth, it was seriously inefficient. The uncertainty and the deplorable after-effects of these exploratory operations have vanished with the development of the cystoscope and the X-rays as methods of examination. And yet the surgeons who did not use the cystoscope clung to these methods. I quote from a comparison made by one of them : " It (the cystoscope) is an absolutely useless adjunct in diagnosis, for with the finger passed through the dilated urethra we can learn all that we want to know, and that too without submitting the patient to any more risk or unpleasantness than the endoscope."

I shall now discuss a few problems of interest in regard to the common diseases of the urinary tract.

Urinary infections.—Our views on spontaneous infection of the urinary tract other than tuberculosis and gonorrhœa have passed through various phases during the last thirty years. In the early phase the infection of each part of the urinary tract was regarded as a distinct entity. Pyelitis, cystitis, prostatitis, each had a separate and independent existence and each an appropriate treatment. Then came a phase of generalization, when the term "urinary infection" began to appear. Every infection was a "urinary infection." To speak of pyelitis or cystitis was old-fashioned. It was a period of vaccines and urinary antiseptics; local treatment was avoided. Lastly we have come to a view embodying both these phases. Spontaneous infection is an end-product, the bacteria being derived mostly from the bowel and its adnexa. In the acute stage the inflammation frequently affects the whole tract but some part bears the brunt of the infection. Instrumental

interference in the acute stage, short of relieving retention of urine, is avoided and the treatment is soothing and general. Later the concentration on one focus becomes more pronounced as the infection becomes more chronic, and now instrumental examination and local treatment are invaluable.

I shall refer to one method of general treatment, namely, the intravenous administration of antiseptic drugs.

Urotropin has been used intravenously by Blanc [11] and Cooke [12], and mercuric chloride has also been injected, but the most important contribution to this subject was made by Dr. Hugh Young [13] of Baltimore, who advocates intravenous administration of mercurochrome in urinary infections.

The limit to the use of antiseptic drugs in this method is the effect on the renal epithelium. Young claims that mercurochrome has no injurious effect on the kidneys, but other observers do not entirely agree with this.

Braasch and Bumpus [14] found that in two out of 196 cases of urinary and other infections treated by this method the patients died from toxæmia. They considered the method effective in acute infections of the urinary tract but useless in chronic infection.

My own experience has been in a small number of cases. From these the following conclusions are drawn : I found that when the urinary organs were affected as a part of a general septicæmia, the intravenous injection by mercurochrome did not affect the course of the disease. In persistent pyelitis and pyelocystitis which resisted other methods no beneficial effect was observed.

When a septicæmia originating in the urinary organs had become established, an immediate improvement might be observed, but relapses took place and repetition of this treatment had less effect. When a persistent or recurrent toxæmia of serious degree had the kidney for its origin, intravenous injection of mercurochrome might produce a striking recovery where other methods had failed.

Intravenous antiseptic treatment must, I think, rank as an important method of treatment in serious cases of urinary infection, but with the recognition that there is an element of danger in its use.

Urinary tuberculosis.—The modern treatment of chronic renal tuberculosis is nephrectomy in all cases, provided that the second kidney is healthy and there is no definite contra-indication.

In the decade 1890-1900 the mortality of nephrectomy for tuberculosis of the kidney was 25·4% (Schmieden) [15]. At that period no adequate means of ascertaining the presence or condition of a second kidney was employed. As illustrating the modern results of this treatment I select figures from three different countries.

Wildbolz [16] (Switzerland) 1924, 500 cases, mortality   ...   ...   2·5%.
Judd and Scholl [17] (America) 1924, 863 cases, mortality   ...   ...   2·7%.
Thomson-Walker [18] (England) 1927, 193 cases, mortality ...   ..   2·5%.

The late results in these cases were as follows :

Wildbolz   ...   .   19·4% died, 61·5% well.
Judd and Scholl   ...   .   31·0% died, 58·6% well (10% improved.)
Thomson-Walker   ...   .   17·1% died, 60·3% well (22·5% improved).

The cases classed as improved were those in which the general health was good but there were still bladder symptoms.

This treatment, i.e., nephrectomy, rests on three postulates of the surgical pathology of chronic renal tuberculosis.

(1) Chronic tuberculosis of the kidney is a progressive disease. Having become established in the kidney, it extends until the organ is completely destroyed. In some cases (10%) a part of the kidney is destroyed and shut off from the rest of the

urinary tract (closed renal tuberculosis). On this is based the practice that however small the focus of tubercle in the kidney, the organ should be removed.

(2) Chronic tuberculosis of the kidney in adults is unilateral in the early and bilateral in the late stage. Nephrectomy in the unilateral stage is the object of the modern treatment.

(3) Removal of the tuberculous kidney prevents, in most cases, the infection of the second kidney.

From the fact that the second kidney rarely ($1\cdot8\%$ in my cases) becomes infected after nephrectomy and is frequently infected (50%) if nephrectomy is not performed, it is supposed that the second kidney is infected from the first and not from the primary focus.

The results of treatment by nephrectomy have been satisfactory, as these large series of cases show, but the success of the treatment depends upon the stage at which it is applied. The later nephrectomy is delayed, the greater is the danger of infection of the second kidney.

Nephrectomy has been recommended in the late stage when the second kidney is known to be infected with tubercle but the results have been disastrous. Within a short time of the nephrectomy the mortality has been 75% (Ekehorn [19]), 70% (Israel [20]) and $81\cdot2\%$ (Braasch [21]) in three series of cases.

Lately, the basis of these opinions has come under review and criticism. It is held that : (1) Renal tuberculosis, being a blood-borne disease, must be bilateral in all cases. This is an old and obvious argument. If, however, we apply this principle to renal tuberculosis, we must apply it to all blood-borne infections (staphylococcal infection by the *Bacilli coli*, etc.), and to all bilateral organs, a proposition that does not bear careful examination.

(2) The absence of tubercle bacilli in the urine of a kidney is no proof that a tuberculous lesion does not exist. It is admitted that the proportion of cases in which the tubercle bacillus is found in the urine in proved tuberculous kidneys varies from $80\cdot3\%$ (Thomson-Walker) to 85% (Persson [22]) and in the remaining 15 to 20% of cases no tubercle bacilli are found. The reasons for this I have discussed fully elsewhere. In these cases, however, other signs of tuberculosis of the kidney were present and led to a diagnosis.

(3) If tubercle bacilli are present in the urine of a kidney, a tuberculous lesion of that kidney exists.

(4) Tubercle bacilli are known to have been present in the urine of a kidney and to have disappeared without subsequent development of clinical signs of tuberculous disease.

These last two points are closely related and they open up a long vista of experimental work and clinical observation. On them is based the view that bilateral tuberculosis of the kidney is common, if not invariable, and that the lesion of the second kidney frequently heals.
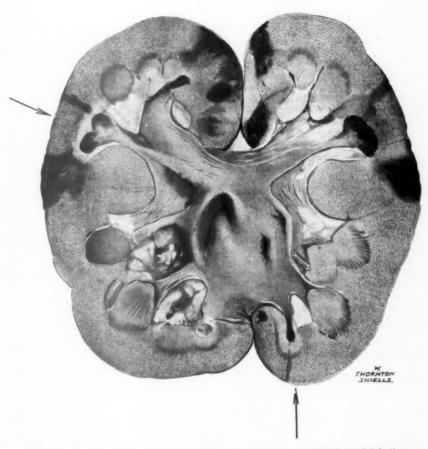
The presence of tubercle bacilli in a clear urine has been widely accepted as an indication that the bacilli have passed through the kidney epithelium without producing a tuberculous lesion. The presence of albuminuria in such cases was accepted as an indication that a mild type of nephritis was present, but absence of tuberculous lesion post mortem was regarded as proof that no tuberculous lesion had existed (Foulerton and Hillier [23], Kielleuthner [24]). Experimental work by Medlar [25] indicated that serial sections of the kidneys were necessary in order to discover the tuberculous lesions, and these lesions were in process of healing.

Harris [25] recently stated that he found tuberculous bacilluria in 37% of adults suffering from bone and joint tuberculosis, and Nitch [27] has described a case in which tuberculous bacilluria was present for two and a half months ; it then ceased and the patient was well eleven years later.

We find, however, that the proportion of cases of surgical tuberculosis of the kidney in which tuberculous disease of bones and joints is present, is small (6%, Braasch).

It is suggested that the lesions that accompany tuberculous bacilluria heal and do not progress to the destruction of the organ. It is remarkable, however, how

Areas of healed tubercle in kidney removed for acute hæmatogenous staphylococcal infection.

rarely we find any evidence of healing by scarring, short of destruction of an entire segment or a whole kidney in the closed type.

I have described [18] such a case in which, in a kidney removed on account of acute staphylococcal infection, the apex of a pyramid was cupped and a healing tuberculous lesion was present, but such conditions are rarely discovered although careful search is made.

On reviewing the matter, it seems to me that the lesions produced in the experimental work, and the conditions observed by Harris in tuberculosis of bones and joints relate to a different type of tuberculous infection of the kidney from that we know as chronic renal tuberculosis or surgical tuberculosis, and are more nearly akin to the condition known as miliary tuberculosis, possibly a mild form of this type of renal tuberculosis.

How should we, in practical surgery, apply these rather startling statements that renal tuberculosis is usually bilateral, and that healing of the tuberculous lesion frequently occurs ?   Are we to abandon early nephrectomy and wait to see if treatment with tuberculin, heliotherapy, and general hygiene will bring about a cure of chronic renal tuberculosis such as is claimed to occur in these recent articles ? I have seen many cases treated by these methods and, although temporary improvement has taken place, I have never seen a cure.   Wildbolz found that of 316 patients treated by non-operative methods, only 20% were alive after five years.

Early nephrectomy as the treatment of surgical tuberculosis is, I believe, justified by the immediate and late results, and must still remain the treatment of choice. Tuberculin, heliotherapy, the ultra-violet rays, and general hygiene are valuable as accessory methods.

Bladder growths.—In the bladder we have to deal with simple papillomata and with malignant growths.   We recognize that papilloma of the bladder possesses a characteristic common with the malignant growths, namely, recurrence.

Recurrence after treatment is the most serious problem which we have to face both in simple and malignant growths of the bladder.

(1) Recurrence of simple papilloma. — There are three likely causes of recurrence of simple papilloma after treatment, namely : (i) Overlooking small growths.   (ii) Implantation of fragments.   (iii) Persistence of the original cause.

(i) Overlooking small growths.—At the time when exposure of the bladder cavity was imperfect and growths were removed by twisting with blunt forceps or cutting with serrated blades, small papillomata were frequently overlooked.   With the systematic cystoscopic examination and charting of the growths and the full exposure of the interior of the bladder by the Trendelenburg position, and proper retraction, there is little room for overlooking growths at the present time.

(ii) Implantation during treatment.—The ease with which microscopic fragments of papilloma become implanted in the mucosa of the bladder, to develop later into papillomatous growths, is generally recognized.

These recurrent papillomata [28] are frequently found in the ·neighbourhood of the cystotomy scar.   On two occasions I have had the misfortune to implant a papillomatous growth in the subcutaneous tissues of the abdominal wall.   Many years ago I tried to develop a technique that would prevent these implantations [29].   It included the following: (*a*) Pre-operation washing and distension of the bladder with weak solution of nitrate of silver (1 in 10,000).   (*b*) Careful charting of the growths by the cystoscope.   (*c*) Free exposure of the entire mucous membrane by the Trendelenburg position and special retractors.   (*d*) The application of a strong solution of silver nitrate (4%) or other coagulant to the growths immediately on opening the bladder.   (*e*) Forceps used in removing the growth to be sterilized before further use at the operation.   (*f*) Careful protection of the edges of the bladder and abdominal wounds.   (*g*) Swabbing of the whole bladder mucosa with strong nitrate of silver solution (4%), resorcin, or formalin.

The application of strong solutions was taken up by Young and others in America, and Beer, of New York, considers that the flooding of the wound with strong alcohol has been of the greatest value.   With the introduction by Beer [30] of cystoscopic fulguration, it was hoped that recurrence from implantation would disappear.   But

unfortunately recurrence takes place after cystoscopic fulguration, as it does after open operation.

An exact comparison of the results of the two methods in this respect is not easy to make, for we must remember that the more numerous the growths, the greater is the tendency to recurrence, and the multiple growths are those most frequently submitted to open operation.

Joly [31] says that the proportion of recurrences after cystoscopic diathermy in cases of single growth is slightly greater than that after excision.

Up to 1923 I had treated 119 cases in private practice by cystoscopic fulguration and I obtained the late results in 86. The growths persisted or recurred in 22 (25·5 %) and there was freedom from recurrence in 64 (74·5 %). There were 143 cases of excision of papilloma by open operation with a mortality of 3·45 %. I traced 108 cases and of these there was no recurrence in 71 (65·74 %), and recurrence in 37 (34·25 %). Thus, in my cases, which included multiple as well as single growths, the recurrence was greater after open operation.

As cases treated by cystoscopic fulguration have accumulated, I have noticed that recurrence of the papilloma round the internal meatus became more frequent and this is now a common form of recurrence in these cases. It is due either to implantation of fragments by the cystoscope or to injury at the neck of the bladder diminishing resistance to the growth of fragments brought by the urine. Thorough washing with silver nitrate solution after the fulguration might possibly reduce this form of recurrence.

(iii) Persistence of the original cause.—In 1895 Rehn [32] published three cases of growths of the bladder in workers in an aniline factory in Frankfort-on-Main. Further articles appeared on this subject in 1898 (Lichtenstern) and 1900 (Wendel), and in 1912 Lauenberger [33] published 18 cases of bladder growth in workers handling aniline dyes at Basle. This observer found that during forty years (1861 to 1900) before the development of the aniline chemical industry in Basle, 6 cases of tumour of the bladder were examined at the surgical clinic in that city. During ten years (1901 to 1910), after the establishment of the chemical industry, 16 cases of growths of the bladder were seen, 10 of which occurred in aniline workers and 2 in dyers. The products that are suspected to be deleterious are all amino compounds and enter the body by various routes, aniline, which is volatile, by the respiratory organs, others by the alimentary canal, the skin, and mucous membranes. Large quantities of these products are found in the urine of the workers. MacAlpine [34] in 1929 stated that during the past ten years 6 in 91 cases of papilloma of the bladder that he had seen occurred in workers in aniline factories and he had seen the records of 9 other cases which have occurred in dye workers in Manchester since 1920.

Since the publication of Lauenberger's article I have systematically questioned all my patients who suffered from papilloma of the bladder as to any connection with the manufacture or handling of dyes, but have failed to elicit the connection in a single case. It is obvious that only a small proportion of the patients suffering from papilloma of the bladder have any connection with the handling of dyes, but that other irritating chemical bodies may be admitted to the body and have a similar effect is more than likely. It seems to me that a full chemical analysis of the urine in all cases of papilloma of the urinary tract might form the starting-point for further work on this important subject.

Recurrence in malignant growths.—The treatment of choice for malignant growth is resection of the bladder wall, and in late cases total cystectomy has been practised.

I will begin by giving the statistics of partial cystectomy or resection of the bladder in my cases up to 1923 : Partial cystectomy, 126 cases, 8 deaths (6·34 %). Recurrence under three years, 22 in 81 traced cases (27·16 %) ; recurrence over

three years, 5 in 81 (6·17 %) ; total recurrence, 27 in 81 (33·3 %) ; no recurrence, 54 in 81 (66·6 %). Thus, two-thirds of the cases traced had no recurrence. But this, unfortunately, is not the full story. In 491 cases [35] of growth of the bladder seen up to 1924, there were 83 beyond any operation and 35 in which only a palliative operation could be performed. Thus, 118 out of 491 cases (24 %) were inoperable when they first came under my observation.

I noted the reason of the inoperability in 76 cases. It was as follows : Extent alone, 52 ; extent and sepsis, 8 ; extent and position, 9 ; extent and general condition, 5 ; general condition, 2. The factor of extent was present in all but two. This means that the patient was not seen early enough to give him a 66·6% chance of cure by operation. Macdonald [36] puts the proportion of inoperable cases even higher. In 120 cases there were 85 inoperable and 35 operable.

How can this proportion of inoperable cases be reduced ? There are two possible lines of advance. Firstly, more extensive operation than resection of the bladder might be undertaken ; secondly, an earlier diagnosis and resort to operation might be made. I need not discuss radiation, for the reports on this method, together with my own experience, do not hold out any prospect of cure.

Recently, total cystectomy has been reconsidered in advanced cases. Successful cases, in respect to survival from the operation, are now frequently reported (Wade, Chute, Federoff, Huyntschak, Papin, Beer and others), and prove that total cystectomy can be performed and the patient survive, although the authors have still some doubt as to the safest method of performing the operation. Of the late results, however, we have only a few records, and until we have more convincing proof that the operation promises a reasonable prospect of permanent cure, it must still be considered too severe to be undertaken merely in order to prolong life for a few months or to ameliorate the symptoms.
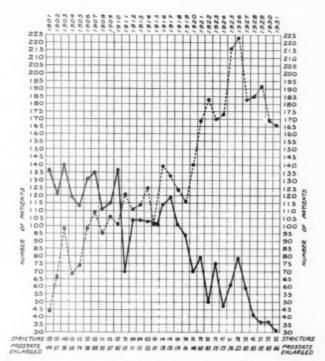
The second method of reducing the 24% of inoperable cases is earlier diagnosis and resort to operation. This can only be brought about by education of the general practitioner in the early diagnosis of these diseases and in the results that can be obtained by early operation.

Urinary obstruction.—The two common forms of urinary obstruction are (1) stricture and (2) enlargement of the prostate gland.

Stricture.—An examination of the number of cases of stricture of the urethra admitted to the wards of St. Peter's Hospital shows that there has been a progressive fall in the numbers during the last thirty years. In 1901 there were 137 cases of stricture admitted, 78 of which underwent internal urethrotomy, and 11 external urethrotomy. In 1931 there were 32 cases of stricture admitted ; in 18 of these internal urethrotomy, and in five, external urethrotomy was performed. This does not show the total number of stricture cases treated at the hospital—for the great majority of strictures are treated in the out-patient department and are not admitted to the wards of the hospital—but it gives some idea of the proportion of serious cases of stricture requiring operation. During this period the number of cases of the other common form of urinary obstruction has increased. In 1901 there were 44 cases, and in 1902, 67 cases of prostatic obstruction admitted, whereas in 1931, 166 cases of prostatic obstruction were treated in the wards of the hospital. During these thirty years the total number of patients admitted to the hospital each year remained practically the same, namely, 490 in 1901 and 483 in 1931, with an average for the thirty years of 494 per annum. It is possible that with the increased interest in prostatic surgery the prostatic cases may have displaced the urethral cases. But making allowance for this tendency, there is evidence that the number of cases of stricture requiring operation and the severity of the operations required have diminished during that period. One may regard this as the result of increased efficiency in the early treatment of stricture, and also to

Cases of stricture (continuous line) and enlarged prostate (dotted line) admitted
to St. Peter's Hospital during 30 years.

the more efficient public service for the treatment of venereal disease throughout the
country.

Enlarged prostate.—It is now thirty-one years since Freyer [37] began the
energetic campaign that changed the treatment for enlarged prostate from catheter-
life to prostatectomy.

The operation has had a fair trial during those thirty-one years, and in my
Lettsomian Lectures for 1930 [38] I collected 6,750 cases of suprapubic
prostatectomy for simple enlargement of the prostate, performed under various
conditions by many surgeons in this country. The average mortality in these cases
was 11·8%. Considering the serious nature of the disease and the age at which it
occurs, this mortality of the operation appears to me to be a reasonable one.
On examining the figures more carefully, however, we find that the average
mortality of prostatectomy in general hospitals is 19·5% ; in a special hospital 9·9% ;
and in private practice 5·5%. Cabot states that the mortality in hospitals in
America varies from 8 to 20%, and in Germany is 25%.

There will always, I think, be a greater mortality in this type of operation in
public hospitals than in private hospitals or nursing homes. I have discussed this
question fully elsewhere, and have ascribed the difference chiefly to the difficulties
under which the general hospitals work in regard to constant changes of the resident

staff and nurses in charge of these cases, as compared with the more specialized and permanent staff available in a special hospital or private nursing home. The difficulty is partly surmounted by providing special departments in the general hospitals. But even here there is the serious disadvantage that the changes in the resident and nursing staff must fall into line with those in the rest of the hospital.

Another point may, however, be raised. Is the operation as at present practised capable of modification to suit the conditions of a general hospital, without reducing the efficiency of the operation? This is not an easy question to answer at the the present time. As a matter of fact, there is considerable variation in the method of prostatectomy and the after-treatment as practised at the present time. Some surgeons practise the open method, others the simpler blind method ; some practise a single-stage operation and others a two-stage prostatectomy.

One change, which would avoid the complicated after-treatment that is often a difficulty in general hospitals, would be the complete closure of the bladder after the operation. Unfortunately, the dangers attending this procedure at present outweigh those of the post-operation bladder drainage.

Non-operative methods—So far I have considered only open operation. While no one experienced in urology can doubt the necessity for removing the prostate when residual urine has definitely begun to collect, but there are cases in which the symptoms are moderate, residual urine is absent, or only present in very small amount, and the prostate shows little change. Here the necessity for operation is not immediately urgent. In these cases other methods than open operation are often tried and they merit careful consideration.

The following are the more common of these methods : (1) Physical methods. (2) Radiation. (3) Intra-urethral operations at the bladder neck.

(1) Physical methods.—A group of methods may be collected under this term. No permanent organic change in the structure of the gland can be expected from their use. They include massage of the prostate from the rectum, the occasional passage of metal instruments along the urethra, medical diathermy, and electrical currents. These will frequently give relief of symptoms in cases in which there is no definite enlargement of the prostate and no residual urine. Many of these cases, however, may obtain relief, without these more elaborate methods, from the correction of hyperacidity of the urine, or of a persistent phosphaturia or dietetic errors, when this is combined with a soothing mixture and an assurance that no serious disease is present.

When these methods are to be used a careful selection of cases is necessary. I have seen a case of cancer of the prostate treated for two years by massage, and another of stone in the bladder treated by electrical currents passed through the prostate. I would suggest, therefore, that while relief of symptoms may be obtained in the proper cases by such treatment, its adoption should be conditional on a complete examination by some one competent to make what is often a difficult diagnosis.

(2) Radiation.—Radiation has a very definite field of usefulness in cancer of the prostate, which I have discussed elsewhere [35]. In simple enlargements of the prostate the rôle of this method of treatment is not so certain.

In the group of cases to which I have referred above, in which operation is not urgent and the patient is in no surgical danger, it is natural to look for some line of treatment that might delay, or possibly arrest, the progress of the enlargement. Further, there are patients with enlarged prostate and residual urine who, for one reason or another, cannot face a serious operation.

For the application of radium to the prostate an operation is necessary ; some form of prostatectomy would be preferable to the uncertanity of radium, but deep X-ray therapy in skilled hands and with proper supervision is a safe method. Is it,

in simple enlargement, an effective one ?   In the few early cases that I have seen treated by this method the symptoms improved in some, and in others were unaffected.   I have removed the prostate at a later stage in a number of cases, without finding serious difficulty in the enucleation.   I have notes of eight advanced cases of simple enlargement of the prostate with residual urine, treated by deep X-ray therapy.   Several of the patients noted an improvement in the symptoms and one patient on catheter life was able temporarily to give up his catheter, but in none of the cases could I find a real diminution in the size of the prostate or the quantity of residual urine and in none of them was there permanent benefit.

(3) Intra-urethral and intravesical operations.—These include the punch operation of Young and the Luys' operation of "forage" of the prostate and various modifications of these methods.

These operations have for their object the removal of portions of the intravesical obstruction, or the formation of a "gutter" in this projection.   Unless we are to limit them to a small group of cases, we must hold the view that the obstruction in enlargement of the prostate gland is entirely due to the intravesical portion of the enlarged gland ; I see in the medical papers that a prominent surgeon has recently committed himself to this view.   It was held by McGill in 1887 and it took some years to discover that in only a small percentage of cases (under 20%) was the prostatic obstruction relieved by the removal of the intravesical projection. This was the reason for the failure of McGill's operation which led to indirect methods, such as castration, being tried.   Belfield, Fuller, Kümmel and finally Freyer, recognized the importance of the extravesical obstruction and the operation of prostatectomy, as now practised, was developed to meet this fact.
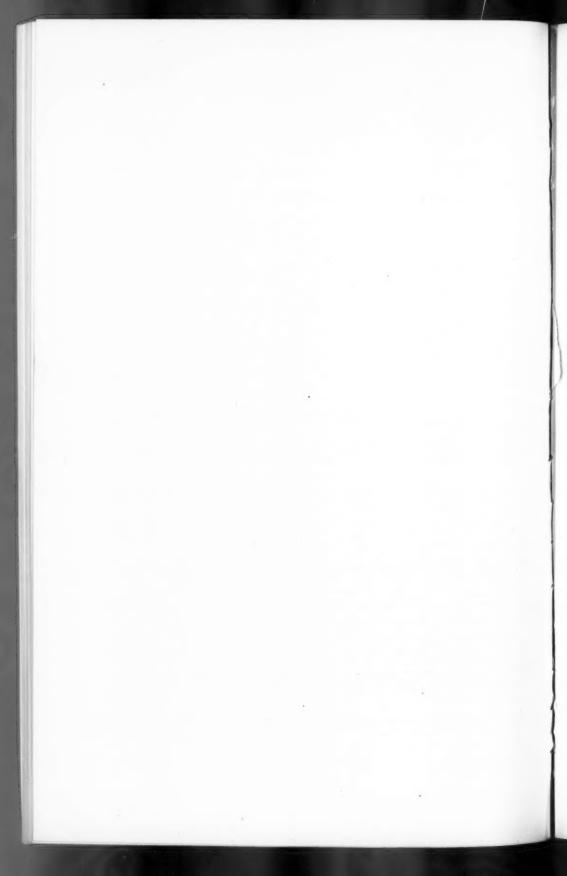
That the functional results of the removal of the extravesical, as well as the intravesical, enlargement of the prostate have justified this view, no one experienced in urology can deny.

It will be unfortunate if we go back, even temporarily, to the beliefs and disasters of forty-five years ago.

REFERENCES.

[1] NITZE, M., *Wien. med. Woch.*, 1879, No. 24, 649.   "Lehrbuch du Kystoscopie," Wiesbaden, 1889. [2] FENWICK, E. HURRY, "Electric Illumination of the Bladder and Urethra," London, 1889. [3] NEWMAN, D., *Glasgow Med. Journ.*, 1883, xx, 81.   [4] ROENTGEN, W. K., *Journ. Roentgen Soc.*, 1923, xix, 112.   [5] MACINTYRE, J., *Lancet*, 1896 (ii), 118.   [6] LEONARD LESTER, *Arch. Roentgen Ray*, 1899 (May), vol. iii.   [7] HOLLAND, THURSTAN, *Journ. Roentgen Soc.*, 1923, xix, 123.   [8] ACHARD and CASTAIGNE, *Bull. et mém. Soc. méd. d'Hôp. de Paris*, 1897, 3 s., xiv, 637.   [9] GUYON and ALBARRAN, *Ann. d. Mal. d. Org. Genito-urin. Paris*, 1897, xv, 1200.   [10] MORRIS, H., "The Origin and Progress of Renal Surgery," London, 1898.   [11] BLANC, H., *Presse Méd.*, 1925, xxxiii, 591.   [12] COOKE, E. S., *New York Med. Journ.*, 1922, cxvi, 524.   [13] YOUNG, HUGH, H., "Practice of Urology," Philadelphia, 1926, vol. i, 220.   [14] BRAASCH, M. S., and BUMPUS, H. C., *Journ. Urol.*, 1926, xv, 341.   [15] SCHMIEDEN, V., *Deut. Zeitschr. f. Chir.*, 1902, lxii, 205.   [16] WILDBOLZ, H., *Chirurgie du Nierentuberculose*, Stuttgart, 1913.   [17] JUDD, E. S., and SCHOLL, A. J., *Ann. Surg.*, 1924, lxxix, 395.   [18] THOMSON-WALKER, J., *Brit. Med. Journ.*, 1927 (ii), 625.   [19] EKEHORN, G., *Hygiea*, 1924, lxxxvi, 353.   [20] ISRAEL, J., *Folia Urologica*, 1911, B. vii, 257.   [21] BRAASCH, W. F., *Amer. Journ. Med. Sci.*, 1920, clix, 8. [22] PERSSON, M., *Ann. Surg.*, 1925, lxxxii, 526.   [23] FOULERTON, A. G. R., and HILLIER, W. T., *Brit. Med. Journ.*, 1901, ii, 774.   [24] KIELLEUTHNER, *Folia Urologica*, 1912, vii, 191. [25] MEDLAR, quoted by BUMPUS and THOMPSON, *Amer. Journ. Surg.*, 1930, ix, 545.   [26] HARRIS, R. I., *Brit. Journ. Surg.*, 1929, xvi, 464.   [27] NITCH, C., *Lancet*, 1925 (i), 1.   [28] THOMSON-WALKER, J., *Lancet*, 1910 (ii), 1409.   [29] THOMSON-WALKER, J., *Proc. IIme Congrès de l'Assoc. Internat. d'Urologie*, 1911, p. 621.   [30] BEER, E., *Amer. Journ. Surg.*, 1928, n.s. iv, 113.   [31] JOLY, J. SWIFT, *Proc. Roy. Soc. Med.*, 1930, xxiii, 1557 (Sect. Urol., 53).   [32] REHN, *Centralbl. f. Chir.*, 1904, xxxi, 122. [33] LEUENBERGER, S. G., *Brit. Med. Journ.*, 1921 (i), 645.   [34] MACALPINE, J. B., *Brit. Med. Journ.*, 1929 (ii), 794.   [35] THOMSON-WALKER, J., *Brit. Journ. Radiol.*, 1926, xxii, 91.   [36] MACDONALD, S. G., *Proc. Roy. Soc. Med.*, 1930, xxiv, 69 (Sect. Urol., 1).   [37] FREYER, P. J., *Brit. Med. Journ.*, 1901 (ii), 125. [38] THOMSON-WALKER, J., *Lancet*, 1930 (i), 1163.

Section of Epidemiology and State Medicine and Section for the Study of Disease in Children.

Chairman—Sir HENRY GAUVAIN, M.D. (President of the Section for the Study of Disease in Children).

[*April* 19, 1932.]

DISCUSSION ON INFECTION IN THE DORMITORY.

Dr. J. Alison Glover:

ABSTRACT.—(1) An attempt is made to show that infection in the dormitory is of paramount importance in most of the epidemics which occur in boarding schools and residential institutions. (2) The conditions in dormitories which favour a rapid and easy transmission of infection are: proximity of beds, deficient and not "cross" ventilation, insufficient floor space, "dead" space in ceiling, and "dead" corners. More than two rows of beds are to be deprecated. (3) The occurrence of epidemic tonsillitis or of serious complications of measles and influenza, and, bacteriologically, the presence of high carrier rates of hæmolytic streptococci, may indicate the presence of such conditions in dormitories. (4) The minima suggested by the Board of Education (*a*) for dormitories and (*b*) for sanatorium wards or sick rooms are important for the prevention of the spread of infection.

In a residential school or institution, infection may occur by many channels and in various places. It may be carried by milk, or by such vehicles as table-ware, pencils, pens, roller towels, or conceivably by books, but it is usually "breath infect breath,"[1] and the infection is wafted in droplet form direct from nasopharynx to nasopharynx. This droplet infection mostly occurs in one of the following, placed in order of their probable relative importance: dormitory, common room, class-room, changing room, study, dining-room, "tuck shop," hall or chapel. The order may vary with the school, but, except in girls' schools, where cubicles are almost universal, and in one or two boys' schools, the dormitory comes easily first.

The dormitory, however, has one serious rival in importance as a place of infection, for during an epidemic of influenza or measles it often seems that many of the dangerous secondary infections due to hæmolytic streptococcus or pneumococcus are spread in the sick rooms and sanatorium wards, and it will be necessary later to speak again of this important factor. Great authorities, from Pringle[2] and Florence Nightingale[3] onwards, through many a Royal Commission,[4] to the mathematical conceptions of Dudley,[5] have emphasized the importance of sleeping quarters in infection.

"Infection in the dormitory" may include infection in washing places, by accidental interchange of towels, and by "ragging," which may bring one in contact with others than one's bedside neighbours, but bed-to-bed infection is the main factor.

1 Timon of Athens, iv, 1.
2 "Diseases of the Army," Sir J. Pringle, 6th ed., 1768, p. 107.
3 "Notes on Nursing," p. 10, footnote.
4 1857-8 ("Sanitary State of the Army"), 1861 ("Sanitary Conditions of Barracks and Hospitals"), 1867 ("Cubic Space Committee").
5 *Med. Research Council, Spec. Rep. Series*, No. 111, "Droplet Infection," p. 5.

This is only natural, for in bed the carrier of infection and its recipient remain in close and undisturbed proximity for nine or ten hours, and ventilation is lessened by the stillness of persons, by closure of doors, and often—during high wind, driving rain, or cold—by the closure of windows. Many children, moreover, sleep open-mouthed and so lose the protection of the nasal filter, and in more than half who now sleep in school dormitories, scar tissue replaces, for weal or woe, nature's first line of defence.

At the outset, let us admit that some infectious diseases—for instance, influenza and measles—are not so good as others for the illustration of dormitory infection. "True" influenza is so infectious and explosive that even in a day-school half the school population has been attacked in one morning.[6] Measles is also unsuitable, not only because it is so infectious that it spreads, like influenza, with a merely brief contact, but because nearly 80 % of children are immune by previous attack before they reach their public school. Moreover, in influenza and measles—probably virus diseases—we can get no help from bacteriological results, except when secondary infections follow them. Diphtheria and cerebrospinal fever, otherwise suitable for the bacteriological study of such a problem, are fortunately too rare in our public and preparatory schools to provide sufficient cases, although Dudley has published excellent work upon the former, carried out at the Royal Hospital School, Greenwich. Perhaps the most suitable diseases for the purpose are the infections due to a hæmolytic streptococcus—tonsillitis, scarlet fever, and otitis media. Thus, whilst the incidence of measles and influenza during 1930 and 1931 has been substantially the same upon boys and girls in the schools participating in the "Inquiry into Epidemics in Schools" of the Medical Research Council, the incidence of certain serious complications has been significantly lower upon girls than upon boys. Girls have had less than half the incidence of otitis media and pneumonia, and only one-eighth the incidence of sinusitis upon the boys. This variation, if it be confirmed by subsequent experience, may have several causes; the greater care the girls receive, their own superior discretion when ill, and their better nutrition may all be partial causes, but it must not be forgotten that nearly all the girls sleep in large, well-ventilated cubicles, whilst nearly all the boys sleep in dormitories.

I pass now to evidence of dormitory infection from the following observations :—

(*a*) In schools which have both day scholars and boarders, the incidence of many infectious diseases is often found to be significantly less on the day scholars.

(*b*) The variations of the incidence of a disease on different dormitories is often significant.

(*c*) Bed charts of dormitories (upon which are recorded the dates and sequence of the onset of the disease) often bear witness so strong that coincidence seems unlikely.

(*d*) When the bacteriological results of sample throat swabbings of all boys sleeping in a dormitory are charted in similar fashion, the groupings of carriers of the same organism, or of the same strain of the organism, often point clearly to bed-to-bed infection. These bacteriological investigations sometimes amplify the clinical data of (*c*).

(*e*) Less direct—but still important—evidence is furnished by the strong correlation between unhygienic conditions in dormitories and the incidence of some infectious diseases.

(*a*) As to the first line of evidence, Dudley has shown the remarkable freedom from attack of scarlet fever and diphtheria which the day boys at the Royal Hospital School enjoyed, despite the fact that, compared with the boarders, they had developed much less immunity when Schick tested. Here are three instances of the same freedom which have come to my knowledge in connection with scarlet fever.

The first is in a small public school which in an autumn term was attacked by scarlet fever due to Type 2 scarlatinal streptococcus. Forty-two cases occurred

6 Chesterfield Grammar School, *L.G.B. Rep. on Influenza*, 1889-90, Parsons, p. 76.

among the 132 senior boarders, an attack rate of 32 per cent., whilst of 75 day boys only 3 were attacked. The day-school rate of 4 per cent. was thus only one-eighth of the boarders' attack rate. In this epidemic there were very few cases of tonsillitis or of "scarlatina sine eruptione." The second is in a public school of 300 boarders who, in an autumn term, sustained 33 cases, an attack rate of 11 per cent. There were 26 day boys who did their preparation in the school, dined at the school, and in fact did everything but sleep at the school. Only 1 case, again an attack-rate of 4 per cent., occurred amongst them. Thirdly, in a school of 260 boarders, situate in a town of some 50,000 inhabitants, scarlet fever had been endemic for two and a half years, the annual attack rate upon the boarders being 6 per cent. The school authorities had been inclined to attribute these dropping cases of scarlet fever to infection brought in from the town, despite the fact that the attack rate on the elementary school children in the town was less than one-twelfth of that of the boarders, and of the 1,500 secondary day children in other schools in the town, the attack rate was only one-thirty-fifth of that of the boarders. In the school itself, none of the ten day boarders had been attacked by scarlet fever, and improvements in ventilation and spacing out of the dormitories were followed by an immediate and complete cessation of the scarlet fever.
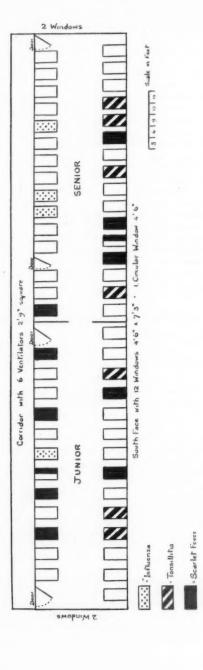
(*b*) The variation of the incidence of disease in different dormitories is often striking, and may point either to the presence of a causal carrier or to conditions of overcrowding or bad ventilation, which favour the occurrence of a high carrier rate. A small outbreak of scarlet fever, due to a heterogeneous strain of hæmolytic streptococcus, occurred in a school in which the hygienic conditions were exceptionally good. Eight cases occurred in the whole school of 475 boys, but 4 of these occurred in one dormitory of 29 boys. Investigation showed that this dormitory was one of the only two dormitories in the school which showed any overcrowding of beds, and bacteriological examination eighteen days after the last case showed a still considerable carrier rate. Three of the cases not in the first dormitory occurred in the only other dormitory in which there was too great proximity of beds.

(*c*) Bed charts. Fig. 1 is that of one autumn term's sickness in a modern dormitory designed in accordance with the views of the school authorities, who held that large dormitories made for the maintenance of a healthy tone. The design, though giving ample floor area and cubic space, and a magnificent south frontage, had however some hygienic defects. Large dormitories such as this are epidemiologically more dangerous than small ones, which somewhat limit the "run" of infection; ventilation here is not properly "cross" ventilation, and when driving rain and gales from the south-west compel closure of most of the southern windows, ventilation is mainly by ventilators into a corridor on the north side; lastly, despite the adequate floor area per bed, due to the width of the dormitory, the beds were much too close—about 1 ft. 8 in. instead of the 3 ft., which is desirable.

In the diagram you see not only cases of mild scarlet fever, but also cases which, though called tonsillitis, were probably "scarlatina sine eruptione" occurring side by side. The incidence of scarlet fever upon this dormitory was more than twice that of the incidence upon the school as a whole, and there is little doubt that this is an example of dormitory infection. Here is an example (fig. 2) on a small scale, which illustrates the entire sequence of events from the return of the causal chronic carrier to the dormitory after reactivation by a severe chill and high temperature, despite prolonged isolation.

Another small dormitory (fig. 3) exhibits well the effect of proximity of beds, whilst as a change from scarlet fever I show you a diagram showing both infection in the dormitory and in the sick room in acute poliomyelitis taken from an admirable description by Dr. W. S. Scott Brown.[7] (Not reproduced.)

7 *Lancet*, 1931 (ii), p. 1287.

FIG. 1.

Bed to bed infection in a large dormitory 150 ft. by 24 ft., giving 68 sq. ft. floor area per bed : abundant cubic space : beds too close.
Scarlet fever 10 cases ; scarlet + rheumatic fever 2 cases ; tonsillitis 7 cases ; " influenza " 4 cases.
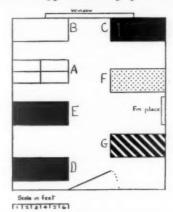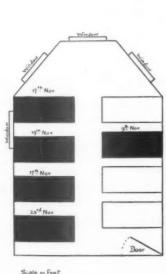
FIG. 2.

Dormitory infection in scarlet fever due to type 2 streptococcus.   18 ft. 6 in. by 16 ft. 6 in.   46 sq. ft. per bed

   A. Causal carrier scarlet fever August 29, returned to school October 20 : chill October 26 ; isolated ; returned to dormitory November 10.   Found still carrying Type 2 January 31.

   B. Taken home November 14 and escaped.
   C. Scarlet fever, onset November 13.
   D. Scarlet fever, November 17.
   E. Scarlet fever, November 19.

   F. Pyrexia, vomiting, November 17 } Probable cases of " scarlatina sine eruptione " as both
   G. Tonsillitis, December 6   } escaped subsequent infection, although there was later
                                      } a high attack rate in the school.

FIG. 3.
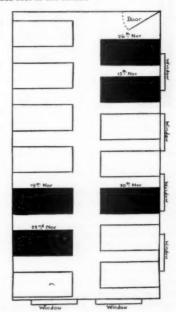
Dormitory Infection : Scarlet Fever.   **Type 2 Scarlatinal Streptococcus.**

A.	*B.*
42 sq. ft. per bed.	35·5 sq. ft.
399 cubic ft. per bed.	377 cubic ft.
1ft.—1 ft. 6 in. between beds.	1 ft. 3 in.—1 ft. 9 in. between beds.

A daily incidence chart dissected to show each dormitory separately may suggest transmission in dormitories by the regular sequence of cases at intervals corresponding to the incubation period of the disease.   Fig. 4 shows, in B, a good example, as the infecting strain of Type 2 scarlatinal streptococcus, though not particularly virulent, was so toxigenic that the cases of scarlet fever were not mixed as usual with cases of tonsillitis.   For contrast, this epidemic is shown alongside of an
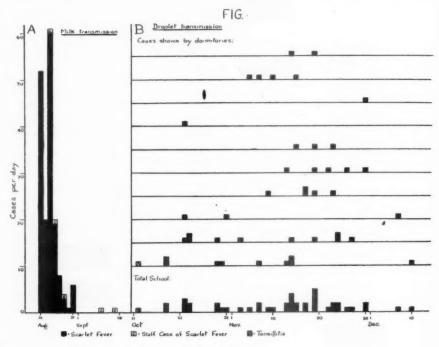

FIG. 4.

Daily Incidence Chart contrasting 2 epidemics (*A.* and *B.*) of scarlet fever due to Type 2 streptococcus.

In *A.* (a children's sanatorium 305 children in 10 wards), cases occurred simultaneously in all 10 wards. Infection was conveyed by milk and there was practically no bed-to-bed infection.

[*S.* = secondary staff case : the staff had a separate milk supply.]

In *B* (three houses of public school with 132 boarders) the incidence of cases in the separate dormitories which occur at intervals corresponding to the incubation period, suggests dormitory infection as a main factor: bed plans gave strong supporting evidence, e.g., Fig. 3.

explosive milk epidemic (A) of scarlet fever also due to Type 2, in a children's sanatorium ; here there was practically no bed-to-bed infection.

Bed charts of the bacteriological results of sample throat swabbings often give very suggestive groupings of carriers, of which I show one or two examples (not reproduced), whilst fig. 5 is a chart of bacteriological investigation combined with

clinical findings in an outbreak of mild scarlet fever due to Type 4 scarlatinal streptococcus. This shows clearly the gaps between clinical cases filled by sub-clinical carriers, the effect of overcrowding of beds in a bright and comparatively well-ventilated dormitory.

When an epidemic of infectious disease of any kind breaks out in a school, the first cases are sent to the sanatorium or sick rooms. If the epidemic be of considerable proportions the sanatorium accommodation is, inevitably, insufficient, and ordinary dormitories have to be adapted for use as sick rooms or sanatorium wards. Two dangers now arise. The first and more serious is that of *overcrowding*. Patients with influenza or measles run a greatly increased risk of serious complications, due to pneumococcal or streptococcal infections, if crowded together, and should therefore be nursed in beds separated by a far greater interval than the three feet space desirable for healthy boys sleeping in the ordinary dormitory, and so for safety it is necessary either to remove half the beds used when the room is an ordinary dormitory, or to leave them unoccupied, so that one unoccupied bed intervenes between any two occupied beds. Particularly in measles, with its copious
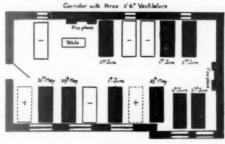

FIG. 5.

Infection in a dormitory in an institution for mental defectives. Mild scarlet fever due to Type 4 streptococcus. Overcrowding of beds.

Cases : Black, with dates of onset.

Carriers : Dotted line ; + swabs taken on June 17.

The beds are shown as patients slept before isolation. 35 ft. by 18 ft. by 12½ ft. 42 sq. ft. floor area and 525 cubic ft. per bed. Beds about 1 ft. 3 in. apart.

catarrh and incessant cough imparting a spraying power unequalled in disease, is such a precaution necessary. If one measles patient be a carrier of a strain of hæmolytic streptococcus with epidemic potentialities, he speedily passes this secondary infection to his neighbour, unless that neighbour be protected from him by sufficient space (such as the 9 feet interval between beds or 12 feet wall space per bed of the Ministry's infectious diseases hospital standard), or by enclosure in a separate cubicle or room. Boys who show any clinical signs of secondary infection with hæmolytic streptococci (such as earache, otorrhœa or adenitis) should be immediately removed from the ordinary measles ward, and nursed in special wards,[8] or, better still, in separate rooms. Otitis media, for example, has been observed to travel all down one side of the ward of a school sanatorium filled with measles convalescents.

The same principles probably hold for pneumococcal infections, for the infective range of such low infectivity diseases as pneumonia and otitis media is immensely increased by the spraying capacity of the measles patient who happens also to be a

[8] Dr. B. A. Peters (Bristol), has recently demonstrated the danger of nursing complicated cases of measles in large wards. *Med. Officer*, December 26, 1931, p. 270.

carrier of these other infections, whilst the resistance of the patient who receives the secondary infection has also been lowered by his own attack of measles. Speaking of hospitals, Debré[9] puts these points clearly, "Collective isolation, without individual isolation, is disastrous for measles patients, who should be placed in completely independent cubicles. . . . Complicated and uncomplicated cases should be nursed in separate quarters." Completely isolated cubicles are an ideal unobtainable in most school sanatoria, but bed isolation by the sufficient standard of space previously mentioned should be attained.

The other danger of which I spoke, though a less serious one, is, I think, worthy of more attention than it has received. It lies in the rearrangement of sleeping neighbours. When dormitories are taken over as sick rooms, considerable re-arrangement of beds (and usually overcrowding) in the other dormitories may be necessary to clear the dormitories selected for sick-room use, and this means that the displaced boys come in close contact with a new set of room-mates, even if overcrowding has been avoided. Bloomfield and Felty[10] in an inquiry into an outbreak of tonsillitis among hospital nurses, showed that the disease broke out afresh whenever the sleeping accommodation of the nurses was rearranged, so that they came into close contact with fresh room-mates. They found, too, that the close contact of sharing a bedroom was necessary to produce an infection, whereas the ordinary casual contact of the day rooms (probably not so intimate as those of a school) was not effective.

Excellent minima[11] have been laid down for dormitories by the Board of Education in the "Suggestions for the planning of new buildings for secondary schools," but in boys' schools at least, even some of the wealthiest, these wholesome minima are very often unattained. The question may be asked: Can any system of cubicle or "horse-box" be considered to obviate or diminish the need for floor space and wall space? Cubicles of the size suggested by the Board of Education have undoubtedly a favourable influence on dormitory infection, but cubicles or "horse boxes" which are too small, in my experience do not have much effect.

Another expedient sometimes recommended is "head and tailing," but it is doubtful whether this has any effect beyond perhaps imparting a feeling of satisfaction that at least something has been done.

Two points are not dealt with in the suggestions of the Board of Education.

(1) The first is the importance of avoiding "dead" space in dormitories, a serious hygienic defect often found particularly in buildings designed for other purposes which have been adapted for school buildings.

(2) But perhaps the most important question which the suggestions do not answer is whether the dormitories should be heated. Upon this I try to preserve an open mind, hoping that perhaps some evidence may accrue from the Committee of investigation into epidemics in public schools, but my prejudice is in favour of the unheated dormitory, with a separate washing room, which should perhaps be moderately heated. The question is complicated by the increasing number of children who come from houses which are centrally heated. The proven value of open-air wards for sick children renders almost certain the success of open-air

9 Debré and Joannon P., "La Rougeole," Masson et Cie, Paris, 1926.

10 A. L. Bloomfield and A. R. Felty, *John Hopkins Hosp. Bull.*, 1923, p. 893. (Summarized by Stallybrass.)

11 *Dormitories*: At least 3 ft. between beds; floor area not less than 65 sq. ft; cubic space of 700 cubic ft. [Ventilation must be adequate and "through," by arranging the windows on opposite sides of the room.]
    Cubicles: If partitions be not carried to ceiling, 65 sq. ft. and 700 cubic ft.; if partitions be carried to ceiling, 100 sq. ft. and 1,000 cubic ft.
    Sick Rooms: Not less than 6 ft. between beds; a window between every two beds.
          100 to 120 sq. ft. } per bed.
          1,000 cubic ft. }
    "Suggestions for the Planning of New Buildings for Secondary Schools," Educational Pamphlets, No. 86, p. 54. Board of Education.

dormitories for healthy children, and we may look forward to the day when some enlightened school will provide half the pupils with open-air dormitories, and the other half with dormitories in accordance with the minima of the suggestions of the Board of Education.   This would enable a controlled experiment to be made.

Most of the charts and instances of infection which I have described have been observed in school outbreaks investigated for the Ministry of Health, but a few have been observed during work for the Committee of Investigation into Epidemics in Schools appointed by the Medical Research Council, and I am indebted to the Committee for permission to use them.

My best thanks are due to my colleague, Dr. F. Griffith, who has done the bacteriological work, and to Dr. Joyce Wilson for drawing the plans and for other help.

Surgeon Captain Dudley : Dr. Glover having summarized the evidence, it will be assumed in the following remarks that where many people sleep close together in one room a great part of the total morbidity which they exhibit is contracted in the dormitory.

In order to have a peg on which to hang some ideas, the accompanying table of attack rates was made from the official statistical returns on the health of the Royal Navy.   The rates given cover all the recorded morbidity, except injuries and venereal disease.   (The amount of the latter in training establishments is statistically negligible.)   The table refers to three naval groups.   The first is H.M.S. "Impregnable," an old wooden line of battleship used for training boys ; the boys

A TABLE OF ALL MORBIDITY EXCEPT INJURY AND V.D.

			"Impregnable"		"Shotley"		Atlantic Fleet
Mean strength	...	...	995	...	1,740	...	21,400
					Rates per 1,000 per annum.		
Infectious disease	...	...	154	...	147	...	31
Pneumonia	...	...	13	...	6	...	1·7
Rheumatic fever	...	...	19	...	10	...	1·6
Ear disease	...	...	44	...	25	...	3·9
Eye disease	...	...	34	...	16	...	5·3
Respiratory disease	...	...	401	...	252	...	54
Digestive disease	...	...	180	...	179	...	60
Other disease	...	...	561	...	192	...	83
Total	...	...	1,406	...	827	...	241

Period 1921 *to* 1927.

slept in hammocks which literally often touched each other.   She was considered unhygienic, and was closed down in 1928.   The second is Shotley training establishment, a modern pavilion building, where the boys sleep 40 per dormitory, in beds a foot or two apart : the whole environment is much better than that of the old "Impregnable."   The third column shows the corresponding morbidities among the men of the Atlantic fleet during the same period—1921 to 1927.   Ignoring the Atlantic fleet for the moment, and comparing the first two columns in the table, we see that all the rates shown were higher in the "Impregnable" than at Shotley. In both establishments the boys were the same age ($15\frac{1}{2}$ to 17 years) and social class, had the same rations, were the same time under training (fifteen months) and performed the same duties, yet the morbidity for disease was 77% higher in the "Impregnable."   The first two columns in the table refer only to boys under training.   A naval training estblishment also harbours a large instructional and administrative staff of selected trained naval ratings, which form about 30% or more of the total population.   During the same period as the rates in the table refer to, the attack rate for total disease among these seasoned ratings was 179 per 1,000 per annum in the "Impregnable" against 201 at Shotley.   Thus

the morbidity among the staff was actually a little lower in the "Impregnable" than at Shotley, which weighs against the supposition that the excess of disease in the old hulk was due to climate, or geographical locality.

The disease categories in the table are unfortunately vague. Each consists of a mixture of clinical or bacteriological entities. I may however add that a companion table, made for the seven pre-war years 1907 to 1913, reproduces all the phenomena seen in the present table. Getting rid of the most indefinite groups first, it should be stated that "respiratory disease" is 90%, Naval "catarrh," which in turn consists of "feverish colds," and other trivial ailments, as well as much influenza for which catarrh is a common euphemism in the Navy. A large part of "digestive disease" is simple diarrhœa and colic, with a small fraction of more serious abdominal complaints, but usually more than half in this category is tonsillitis and sore throat, which, rather strangely, is classed in the Navy as a digestive disease. I should however surmise from my own experience, and from certain anomalies in the individual yearly returns from which the table was made, that the greater relative predominance of "other diseases" in the "Impregnable" over Shotley is due to the inclusion in the former of many sore throat cases in this heterogeneous collection of unclassified ailments. The first five categories in the table are more definite and fairly comparable. Infectious diseases are the commoner fevers and exanthemata of the young, including diagnosed cases of influenza. Pneumonia, which includes broncho-pneumonia, and rheumatic fever were probably well recorded and diagnosed. It must be explained that diseases of the eye are about 90% conjunctivitis, and of the ear, 90% otitis, externa and media—what fraction was middle-ear disease is not known. Now, assuming that the difference in the morbidity between these two training establishments was in a large part determined by the inhabitants of the one using beds, while those of the other slept in hammocks, it is noteworthy that the incidence of the most infectious group of diseases was practically the same in each establishment, while the less infectious, but more serious conditions—pneumonia and acute rheumatism—were doubly prevalent in the denser environment. Diseases of the ear, which are an index of the prevalence of that serious complication of infectious disease, otitis media, were also twice as common as in the "Impregnable." Conjunctivitis shows the same phenomenon. It is possible that epidemics of conjunctivitis spread by droplet infection. The inference drawn from this contrast in attack rates is that, although a small increase in the space between beds may be ineffectual in hindering the transmission of the more infectious diseases, yet the extra space may effect a reduction in the incidence of serious complications and diseases of low infectivity.

In the last column in the table the figures act as a "control" to those in the first two. The trained naval ratings at sea sleep closer together than do the boys in the training establishments, yet the men in the Atlantic fleet only suffered from a fifth to a third of the morbidity exhibited in the first two columns of the table. The lower morbidity of the trained men may be the result of a "seasoning" process which they have undergone in the training depots.

The excessive amount of infection envisaged in the first two columns of the table may be termed the "recruits' epidemic." Such high morbidities are only evident in the first year of service; the morbidity afterwards is not markedly different from that shown for the Atlantic fleet. To a greater or less extent, the phenomenon of the "recruits' epidemic" is seen in all services and schools. It would be most valuable to know whether it is possible to attain the "seasoned" condition, as represented by the Atlantic fleet, without such high attack-rates as were reported from Shotley training establishment. It seems to me not improbable that if new boys or recruits are given a greater share of space, especially dormitory space, than senior boys or trained men, they would adapt themselves gradually to their new bacterial environment and become "seasoned" without the large morbidities which are at present considered unavoidable.

Now let us consider a more practical problem—the grouping of beds in a large dormitory. The top line of the adjacent diagram shows the usual way in which 12 beds would be placed along a 70-foot wall. This arrangement, which gives four feet between the edges of adjacent beds, will hinder the transmission of meningitis from soldier to soldier, but it will not prevent the spread of scarlet fever among children. Bed isolation treatment has shown that nine feet between beds are necessary to stop the dissemination of the symptomatic scarlet fever or diphtheria in a hospital ward. It is my belief that most of the commoner infections easily traverse three or four feet during a nine-hour night. Now if the beds are arranged as in the middle line, on the same seventy feet of wall, the pairs of beds become separated by nine feet. It is obvious, if a microbe can cross four feet, but not nine, that, under the conditions envisaged in the top line of the figure, there is no reason why all the inhabitants of the dormitory should not become infected when such a microbe is introduced. In the twin-bed arrangement, only one secondary case is possible.
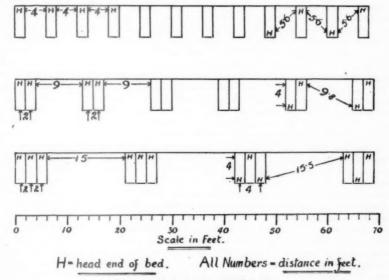

Diagram of bed-grouping (beds 6 × 2 ft.).

The lowest line of the figure shows the principle carried a step further, giving four groups, each of three beds, with fifteen feet between each group. Such arrangements are equivalent to breaking up a community into sub-groups, so that if one member of the community contracts an infection there is little risk of his passing it on to anyone outside his own sub-group. Though the members of the infected sub-group run a proportionately greater risk, the rest of the community escapes. The "twin-bed" system envisaged in the second line of the figure is eminently practicable and could be combined with head-to-tail sleeping, or "sardining" as we call it in the Navy. Although I am inclined to think with Dr. Glover that "sardining" has little practical value where beds are three or more feet apart, yet, when the space between them is negligible, reversing alternate beds or hammocks more than doubles the distance between the respiratory orifices of their occupants (see diagram). The principle of grouping beds is worth experimenting with, since it might prove an easy way of appreciably lowering the total amount of dormitory infection without expending a penny.

In discussing dormitory infection it is most essential to keep the subject in proper perspective. While it may be sometimes possible to prove that a specific individual or sub-group must have been infected while in a ward or dormitory, it is only an hypothesis that, in the ordinary course of events, many people are infected while in bed. Moreover it is not a proved fact, but only a theory, that respiratory droplets are a common means of microbic transmission. Although sleeping is so close in the Services, many observant medical officers are of opinion that the dormitory has been overrated as a site of bacterial dissemination. They believe that more disease is contracted when men are aggregated in other places, such as during meals, or at the canteen or cinema, and that if infection spreads in a dormitory, it is on those occasions when the occupants crowd round a stove, or each other's beds, reading or " yarning," rather than after they have actually turned in. Nevertheless, the majority who hold these views agree with me that the respiratory spray is still the chief vehicle of transmission. But are we right ? In 1919 Lynch and Cumming [1] published a paper in which they suggested that more influenza was caused by the unsanitary methods of washing up eating utensils, than by droplet infection. This method of bacterial transmission is usually termed " saliva-borne." But saliva may convey infection in the respiratory spray, or in ways other than by contaminating mess gear and the water used for washing it. Moreover " saliva-borne " is liable to be confused with " droplet-borne." Therefore " dish-water " infection is a preferable and more descriptive term. In 1930 Cumming summarized his numerous papers on this subject, in an interesting report [2]. I do not think that anyone who tries to put aside all prejudice can read this essay without an uncomfortable feeling that there may be a good deal in it, and that under certain circumstances the contamination of crockery and hands by " dish-water " may be an important source of disease. Recently Major Thompson [3] has published some field observations in the British Army which are consistent with the supposition that dish-water may be an important subsidiary vehicle for the dissemination of influenza. On the other side I think Cumming's work should not be interpreted to mean that dormitory infection, and even droplet infection in general, is always of minor importance. For instance, Major Stevenson [4] writes that for some years all the mess utensils in the Duke of York's Army School have been placed in a steam sterilizer between each meal. The boys are not even allowed to clear away after meals, for fear of infecting their hands from each other's mess kits. Yet, in February, 1931, 40% were attacked by influenza. Stevenson says " the disease showed a tendency to stick to one dormitory before it spread to another, notwithstanding the fact . . . that the boys mixed freely with each other at classes, games and meals. . . . The principal opportunity for its (the epidemic's) spread was the dormitories at night," because " Cumming's main avenue of infection, alleged to cause 80% of influenza, was entirely closed." In Greenwich Hospital School—the equivalent to this Army School—mess-traps used to be sterilized between each meal. The practice was however abandoned some years ago, as it was thought—perhaps wrongly—to have no effect on morbidity, yet the attack rates for the seven last epidemics of influenza have only twice equalled, and not exceeded, that recorded for the Army School epidemic, the description of which would fit closely any of the influenza outbreaks seen in the Greenwich School.

The dish-water theory of infection should be examined carefully by all health administrators, because if this hypothesis was to be verified—and remember that Cumming believes more than 50% of respiratory disease in the civilian population to be transmitted in this way—we should have to insist on efficient sterilizing systems of washing up, not only in the Services, but everywhere. Nevertheless, I feel myself that in the population at large dish-water cannot be a very frequent source of infection. Consider the casual way in which thousands of cheap eating houses wash their crockery. Watch any bar attendant rinse glass after glass in the

same bowl of water, and wipe round inside each with the same dirty cloth. If these admittedly unhygienic practices were "the main avenue of infection," or even a common mechanism of microbic transmission, surely the fact would have been patent long ago ? Yet it is well to preserve an open mind on the subject until more evidence is available.

REFERENCES.

[1] LYNCH, C., and CUMMING, J. G., *Amer. Journ. Pub. Health*, 1919, ix, 25. [2] CUMMING, J. G. (*Military Surgeon*, October, 1930), reprinted in *Journ. Roy. Army Med. Corps*, 1931, lvi, 101. [3] THOMPSON, T. O., *ib.*, 1931, lvii, 81. [4] STEVENSON, A. L., *ib.*, 1942, lviii, 119.

Dr. R. E. Smith (Rugby) : "The danger of infection in the dormitory," the original title of this discussion, was chosen, I presume, because it was thought that infections in schools were chiefly spread in dormitories. This supposition requires critical examination.

Infection by contact or droplet can be spread : (1) In dormitories, studies, dining-hall or in school houses ; (2) in chapel or classrooms ; (3) by games, ordinary social intercourse or by carriers.

At Rugby the dormitories have on an average per boy a cubic capacity of 794 c. ft. and a floor space of 66 sq. ft. Corresponding figures for studies are 265 c. ft. and 31½ sq. ft. In addition, studies are not so adequately cross-ventilated as dormitories, and they appear to me to be a greater source of danger than dormitories even though nominally they usually have a single tenant. The close relationship of boys in classrooms and, more especially, in the dining-room and chapel, makes me increasingly suspicious of the danger of infection spreading in these places. Carrier-spread I shall deal with at length later.
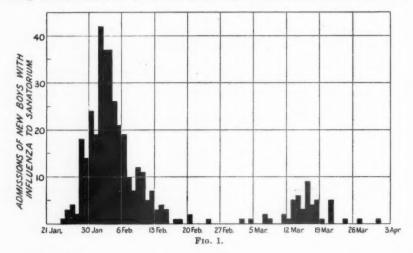
Influenza and measles are the two diseases that trouble the school physician above all others. If these could be controlled, epidemiological problems in schools would be negligible, and this aspect of preventive medicine is my reason for dealing fully with them. Out of 581 boarders 530, or 91·2 %, have had measles and 324, or 55·8%, influenza ; out of 38 day boys 35, or 92·1%, have had measles and 30, or 79%, influenza. The attack-rate of measles is so high, and the immunity it confers so lasting, that elaborate precautions against it are worse than useless. Small epidemics have no terrors. Large ones invariably mean overcrowding, which brings in its train complications and sequelæ due to streptococci. At present we have only 60 boys who have not had the disease, and when an epidemic occurs we shall have ample accommodation for them in the sanatorium, without overcrowding.[1]

Influenza—occurring as an acute epidemic disorder ushered in by protean symptoms and often complicated by secondary infection by pyogenic organisms —is a more serious problem, because it confers no immunity. My opinion, shared by housemasters with whom I have discussed it, is that the dormitory is not the place where it spreads, although, as I shall show later, secondary streptococcal infection may be superimposed on the victims while they are in dormitories. Out of 86 boys in two houses, who had their daily temperature taken routinely, 38, i.e., 44 %, had a temperature as the first sign of influenza, and this, to some extent, explains the extreme rapidity of its spread. Means of preventing it are limited. A healthy Christmas holiday with outdoor exercise as far as possible, limited indulgence in parties and theatres are essential antecedents to the Lent term. I am strongly opposed to regular gargling or routine vaccination. "Public School vaccine" is still used extensively, and I give the experiences from two other schools as well as Rugby. In one, a preparatory school, all the boys—about 150— were given vaccines and not a single case of influenza occurred. In a public school of 700 boys there was an extremely low incidence of influenza, but the few boys who

[1] *Postscript.*—This has now occurred. There were no complications.

were vaccinated had the illness as badly as—if not worse than—the others. At Rugby practically no boys were vaccinated and we had 354 cases. The majority went down in the space of a few days at the end of January and beginning of February, but in March there was a second small epidemic (see fig. 1) scattered throughout the school and of 35 affected 25 had suffered from the disease in February
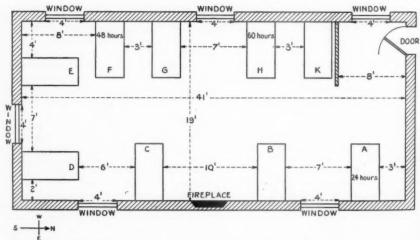

Fig. 1.

FIG. 2.—Plan of room in sanatorium, to illustrate spread of scarlet fever.
Scale 5 ft. = 1 in.   Elevation 12 ft.

and 10 had not. These figures do not prove that one attack of influenza increases the liability to further attacks, but they show that whatever immunity is conferred is of the very briefest duration. If the disease itself confers no immunity it is unlikely that a vaccine can do so.

The following are two examples of spread of infection by carriers.

The first occurred in 1928. The accompanying diagram (fig. 2) explains the arrangement of beds with the space between and the ventilation.

A boy, already suffering from pneumonia with pleurisy, developed mumps and was put in bed A. Eight other boys who were also suffering from mumps were moved into the same room. None had been in contact with scarlet fever. On the following day the boy in bed A developed scarlet fever and was removed to a separate room. In the morning of the next day the boy in bed F and in the afternoon the boy in bed H both had scarlet fever. They were removed to a separate room. Four or five days later the other boys (beds B, C, D, E, G, K) all had scarlet fever.

Here I think there is little possibility of infection of F or H by A. All the boys had mumps and were confined to bed. I believe that the previous history of one of the nurses in charge gives the clue to its spread. During her training (1922-1925) she had scarlet fever. Towards the end of this period—and after having had the fever—she was on duty in the ear-nose- and throat ward of the hospital for three months. During this time sporadic cases of scarlet fever occurred among the patients in this ward, the origin of which completely baffled the authorities. At the end of 1927, while in charge of a private patient who had diphtheria, this nurse had a very bad throat and was given anti-diphtheritic serum. The following day, however, the throat infection was definitely diagnosed as streptococcal and a prediction, which was to prove incorrect, that she would develop scarlatina was made. Within three
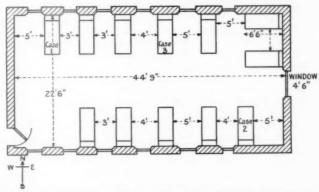

Fig. 3.—Plan of dormitory in which the three cases of "follicular tonsillitis" occurred. Elevation 12 ft. 3 in. Windows on north and south walls 2ft. 3 in. broad, 6 ft. 3 in. high. Scale 8 ft. = 1 in.

months she was employed by us in nursing the boys mentioned. In addition to these nine boys she was in contact with a boy who had a streptococcal empyema, and two others, neither of whom had scarlet fever. But one afternoon she was in contact with another boy and he subsequently developed a rash which was highly suspicious of scarlet fever.

The second example occurred last term. Although less extensive than the former, the evidence of its spread, is to my mind, particularly strong. It occurred during an influenza epidemic. The three cases to be described were all in one house, which was the first house to be seriously affected by influenza, and at the time this house was isolated from the rest of the school (see fig. 3).

The first case was in a boy who had a very mild attack of influenza accompanied by sore throat on February 1 from which he speedily recovered. On February 11 he complained of a sore throat and the left tonsillar fossa, from which all but a few remnants of tonsil had been removed, was bluish-red in colour and œdematous. On February 13 the œdema had spread to the uvula and a few follicles could be seen in the tonsillar remnants. By February 20 the left tonsillar glands were the size of a small egg, and by February 26 there was a large mass of glands below and behind the right ear, and the throat was sore on that side. Periodically the boy had tenderness over the right maxillary antrum, and as his temperature did not settle, the antrum was needled by Mr. Sydenham and muco-pus was

washed out. From this and a previous swab from the throat, *Streptococcus hæmolyticus* was grown. From that time onwards the swelling of the glands diminished and the temperature and transient albuminuria subsided.

The second case[1] was in a lean but alert boy, aged 15½, who had had his tonsils and adenoids removed when he was 8½. From February 1 to February 8 he had a fairly severe attack of influenza, accompanied by sore throat and occasional left frontal headache and tenderness, relieved by inhalations. On February 11 there was folliculitis on the posterior pharyngeal wall and adenoid tissue above the uvula also contained follicles. The following day there was an enormous œdematous mass obliterating the right tonsillar fossa and extending into the uvula. This completely subsided in three days, but a precisely similar swelling appeared on the left side accompanied by a diffuse mass of glands behind the left ear. Feeding was difficult and there was copious diarrhœa, vomiting, and albuminuria, from February 17 to February 21. From February 18 to February 20 there was a succession of purpuric spots. At 7.30 p.m. on February 21 the patient coughed up two drachms of ropy rose-coloured sputum, from which hæmolytic streptococci were found as the dominant organism. From that time he gradually improved and the swelling of the glands subsided.

Case III was that of a boy, who, on January 28, in the routine temperature parade, was found to have a temperature of 100° F. He had streaming eyes and a very red throat, but no other symptoms. On January 9 his tonsils, which had been sore on the previous day, were swollen, and there was commencing follicular tonsillitis. The tonsillitis was far advanced on January 13 when the boy was coughing up much purulent débris from the crypts. The glands on both sides were swollen. On January 14 there was œdema over the left eyelid ; there had been tenderness and pain there on the previous day. Gradually the symptoms and signs subsided, and the boy made a slow but satisfactory recovery. He had transient albuminuria at the height of the fever. Hæmolytic streptococci were grown from the pus from his tonsils.

These were the only cases of this type which occurred among the whole of the influenzal cases. If in the first two cases the tonsils had not been removed, they might have been called cases of follicular tonsillitis accompanied by enlarged glands, transient albuminuria and severe constitutional disturbance. The appearance within so brief a space of each other, their occurrence in a single house, and the impossibility of direct spread, because of the separation of the beds, leaves us with the possibility of carrier spread.

The carrier, I feel certain, was the capable but over-conscientious nurse in charge of these boys. Another nurse informed me that her colleague had a sore throat on the 11th of the month, but as she had no temperature she did not wish to report it. When I saw her on the following morning, she still had no temperature. She had a definite follicular tonsillitis, which she then said she had had for two or three days—since the 8th or 9th. She was immediately sent off duty and was confined to bed with tonsillitis, which necessitated a fortnight's sick leave for convalescence.

It is arguable that she contracted the tonsillitis from one of the boys, but my view is that she had a mild tonsillitis which took some time to mature, and infected those boys who were especially susceptible to streptococcal infections, as is well known to be the case in post-influenzal convalescence.

The idea of a streptococcus carrier is by no means a new one. In what has come to be known as the Hendon epidemic of scarlet fever of 1885[2], it is now generally agreed that the suggestion put forward at the time, that cows acted as passive carriers, is true. Epidemics spread by human carriers are less frequent than those spread by bovine. The epidemic described by Courmont and Sédallian[3] illustrates well the damage that a carrier may do.

From May 12 to June 1 a midwife complained of lumbar pain, but two physicians said she need not stop work. During this time she attended seven cases, in three of which puerperal fever developed, fatal in one case and very severe in a second. On June 2 she had

1 This was Case I of two cases reported in detail in the *Lancet*, 1932, i, 1303.
2 *Report of Medical Officer*, L.G.B., 1883, p. 73.
3 *Courmont and Sédallian. Presse Médicale*, 1931, xxxix, 1325.

a sore throat, a temperature of 103°, and diffuse arthralgia, which lasted for three days, at the end of which a rash developed which was considered not to be that of scarlet fever. By June 9, recovery was complete. On June 3 she attended a confinement, and there was no puerperal fever. From June 9 to 10 she attended three women, two of whom contracted puerperal sepsis, one 24, and the other 48, hours afterwards. On June 3 and 17, and on July 2, hæmolytic streptococci were grown from her throat. This organism was the same streptococcus, culturally and by typing, as a strain obtained in the case of the only woman investigated.

I quote this example in detail because it shows clearly that the carrier is dangerous for several days before—as well as for many days after—the infection, and because it supports my thesis that it was the nurse who infected the boys and not *vice versa*.

In limiting myself to this aspect of the spread of infection in the dormitory, I do not imply that I consider it the only means, but within my short tenure of office as a school medical officer, it is the most dangerous that I have encountered.
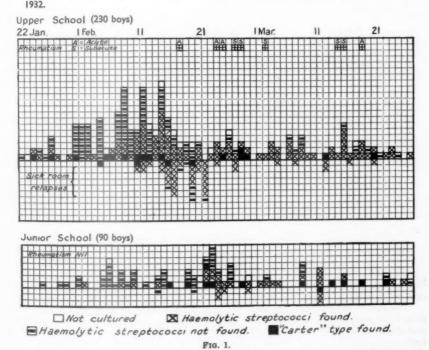
Dr. W. H. Bradley (Downside School, Bath): I have made observations during the past Lent Term in a school which, because of certain peculiarities, offers good material for controlled investigation.

The school is divided into two parts, junior boys being segregated as much as possible from upper school boys, but both schools occupy the same building and have contact in church, school-cinema, and certain passages.

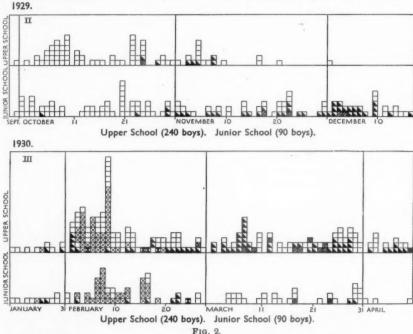An influenza-like peak is the most striking thing about the upper school graph (fig. 1). The parasitic cause of this wave of nasopharyngitis is unknown. A throat swab from each sick boy was examined by Dr. F. Griffith but nothing consistent with

FIG. 1.

Each marked square indicates the admission of a new case. Marked squares below the line indicate results of swabs from boys who relapsed in sick rooms.

a ubiquitous coccal infection was observed. A few cases of primary streptococcal sore throat were certainly present, but these, for the most part, were produced by an organism which had first appeared in the school at the end of the previous term. As the term progressed, hæmolytic streptococci assumed a more important rôle, and at the end of the wave streptococci were causal in the great majority of attacks. These organisms were of at least two strains. One, designated "Carter" in this paper, was serologically type-specific, its identity being confirmed by agglutinin-absorption experiments. The second, on cultural grounds thought to be homologous,
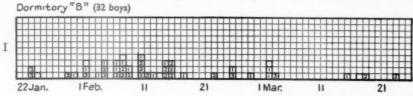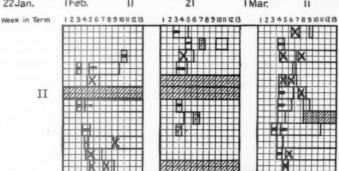

Upper School (240 boys).   Junior School (90 boys).

Upper School (240 boys).   Junior School (90 boys).

Fig. 2.

☐ Pyrexial common cold, febricula or sore throat without exudate

◼ Sore throat with exudate, i.e. Lacunar Tonsillitis. (*Tonsils not necessarily present. Growth frequently observed on lymphoid nodules in absence of tonsil*)

◼ Onset of Rheumatism

▨ Measles

▨ Measles complicated by Pyrexial Lacunar Tonsillitis

(*Reproduced by permission of the Editors of the* "Quarterly Journal of Medicine," *who kindly lent the block.*)

has so far defeated Dr. Griffith's effort at serological investigation; on clinical grounds I suspect that at least three types of hæmolytic streptococci were at work.

The junior school wave was less spectacular, the crest of the wave being some days later than that in the upper school. The junior school spread was less intense and obviously of lower velocity, although the eventual attack rate was the same in both parts of the school. These differences in the two waves are suggestive of phenomena which, on other occasions, have been observed in a marked degree. Thus fig. 2 shows a high incidence of lacunar tonsillitis in the junior school during

Dormitory "B" (32 boys)

22 Jan.   I Feb.   II   21   I Mar.   II   21

Week in Term   1 2 3 4 5 6 7 8 9 10 11 12 13   1 2 3 4 5 6 7 8 9 10 11 12 13   1 2 3 4 5 6 7 8 9 10 11 12 13

FIG. 3.

(I) Each marked square represents a new case of nasopharyngitis excluded from the dormitory.
    | 1 | Coryza. | 2 | Sore throat. | 3 | Sore throat with exudate.

(II) Bed-chart. Horizontal reading = weeks of term. Vertical = Three columns of beds in dormitory. Each bed allowed two squares in relative positions.

☒ Untyped hæmolytic streptococcus present.
☐ Non-coccal nasopharyngitis.
▥ "Carter" type streptococcus present.

47 attacks (attack rate 147 %).   (I) Mean of total period, 11.2.32.   Peak of main wave (30 cases), 9.2.32.   (II) 20 (attack-rate 62%) non-streptococcal cases in first month.   Two groups of untyped (granular) hæmolytic streptococcal throats.   No "Carter" type throats.

Dormitory "C" (34 boys)

22 Jan.   I Feb.   II   21   I Mar.   II   21

Week in Term   1 2 3 4 5 6 7 8 9 10 11 12 13   1 2 3 4 5 6 7 8 9 10 11 12 13   1 2 3 4 5 6 7 8 9 10 11 12 13
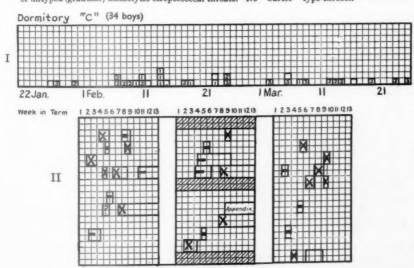
FIG. 4.

33 attacks (attack-rate 97%).   (I) Mean of total period, 19.2.32.   Peak of main wave (15 cases) 14.2.22.   (II) 12 (attack-rate, 35%) non-streptococcal cases in first month.   Two distinct groups of untyped (granular) hæmolytic sore throats.   No "Carter" type cases. [*See legend for fig. 3.*]

Michaelmas term 1929, with a reversal of the picture and a high attack rate in the upper school during the following Lent term, 1930, clinical and incomplete bacteriological evidence suggesting a common ætiology in both waves.

The material environment, weather, sanitation, diet, and dish-water are the same in both schools, and differences in the incidence of sickness in the two groups of boys must be mainly a question of the personnel in the environment.

At this stage I should like to emphasize the importance of the velocity—the tempo—of an epidemic. Not only is this the factor over which the school doctor most desires control, but also it gives some information as to the types and locations of the infections with which he is dealing. Dr. Glover has mentioned that studies of streptococcal infections are most easy of application to the problem of dormitory infection. I suggest that this is because such infections have a comparatively slow tempo. The high speed of measles and influenza causes variations in dormitory graphs to be shorter but none the less significant. The precise implication of this statement will be obvious when it is applied to certain dormitory charts of which fig. 3 is the first we shall consider.

Dormitory "B" bore the brunt of the attack of non-coccal infection. Of thirty-two boys, thirty were laid low in the first month of the term, and for many days almost the whole of one side of the dormitory was empty. The peak of the main wave of infection occurred on February 9, a very high velocity. In the adjacent dormitory "C" (fig. 4) of the same size but containing two more boys, the spread was not only less intense but of lower velocity, the crest of the wave occurring about February 14. The attack on dormitory "R" (fig. 5) which is isometric with B and C, was as rapid as that on B, yet the morbidity was less than half that in B. The boys in these three dormitories mix freely in the school and are housed under almost identical conditions. They are grouped only at night and variations in the attack of this so-called influenza on them would appear to be due to a dormitory factor. I have attempted to establish this fact because many people believe the dormitory to play little part in the spread of high-velocity infections.

So far we have been concerned with the non-coccal, steeple-like epidemic. Let us now turn our attention to the streptococcal trailers which followed it. The high-velocity epidemics are generally the catarrhal ones. Cough is a salient feature in them and cough plays a considerable part not only in the rapid spread of these infections but in the dissemination of secondary invaders. Fig. 1 shows, below the line, a wide-spread streptococcal flora cropping up in sick dormitories, and fig. 6 illustrates this spread. Relapses are marked with a letter N or A and it will be seen how many of these relapses coincided with the appearance of hæmolytic streptococci in the boys' throats. Although this dormitory was spaced at least 4 ft., the spacing was obviously inadequate.

Dormitory "S" (fig. 7), the largest and best spaced in the school, offers a useful comparison with the other dormitories. One side of this room remained comparatively healthy and the main disease was due to a known type streptococcus (Carter), over half the school's total cases of this disease appearing here. Strangely enough, with two exceptions, the remaining "Carter" cases appeared in the upper half of dormitory "R" (fig. 5) whereas the untyped hæmolytic streptococcus spread most in the lower half.

Further study of these charts will show grouped cases in many places. Take dormitory "C" for example (fig. 4).

I have, however, said sufficient to justify my impression that the dormitory is the main location of the spread of disease in semi-isolated communities no matter whether the infection be of high or low velocity. The day-time contacts of the boys are not blameless, but are of minor importance and beyond easy control. The dormitory is within our control, and if it is to survive it must be properly spaced and grouped irrespective of its appearance. A "tidy" dormitory, with beds arranged systematically, makes a much greater appeal to the
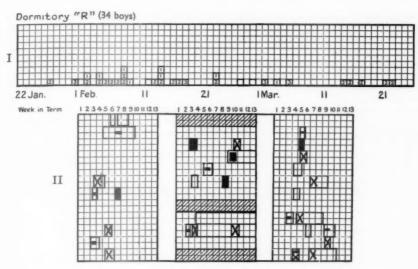
Dormitory "R" (34 boys)

FIG. 5.

(I) 34 boys, 34 attacks (attack-rate, 100%).   Mean of total period, 14.2.32.   Peak of main wave (21 cases) 8.2.32.   (II) 9 non-hæmolytic streptococcal cases in first month (attack-rate, 26%).   Of 16 " Carter " type cases in the upper school 5 occurred in the upper half of this dormitory.   A spread of untyped streptococcal throats occurred in the lower half.   [*See legend for fig.* 8.]
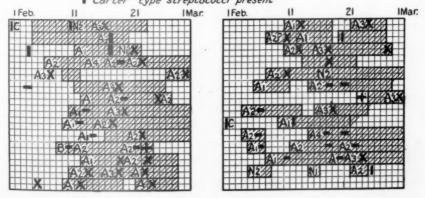
"O.B." Sick Dormitory.

FIG. 6.

Vertical readings : Two squares for each bed, indicating relative positions in dormitory.
Horizontal readings : Each square represents one day.

eye than an irregular lay-out, and school authorities do not readily sacrifice a pleasing dormitory arrangement. I have attempted to make the best use of dormitory room vacated by a sick boy, by approximating the beds of his immediate neighbours, but school matron and dormitory maids will not trouble to make the necessary moves unless they are constantly watched.

And what is safe spacing—safe grouping? Experience with secondary infections in sick rooms has proved to me that a hæmolytic streptococcus can span nine feet and will cross seven feet with comparative ease. To space a dormitory to beyond seven feet is uneconomical and, in most schools, impracticable. The obvious solution
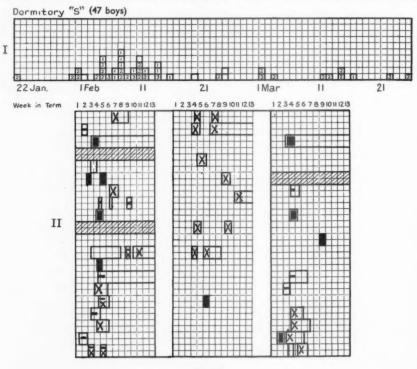

FIG. 7.

(I) 46 attacks (attack-rate, 98%). Mean of total period, 11.2.32. Peak of main wave (32 cases) 8.2.32. (II) 13 (attack-rate 28%) non-streptococcal cases in first month. South side attack-rate twice as great as that of north side which remained comparatively healthy. Suffered main spread of "Carter" type (9 out of 16 cases). [*See legend for fig. 3.*]

is a complete barrier between each boy. Absolute insulation from droplet infection would appear to be more important than perfect ventilation, although the latter is undoubtedly desirable. Our ideal should be to provide for each boy a separate bedroom for night use only. If the attainment of this ideal can reduce the illness in our schools by even a small percentage, if we can moderate the disorganization of school work, limit the spread of various diseases and prevent the occasional tragic death by scrapping the dormitory—then the dormitory be damned.

A fear for moral safety and of financial cost are the main reasons for objection to the single bedder. Adequate spacing in dormitories can only be obtained at the

expense of a more extensive area than that required by the well-proportioned bed-room, which has such a great æsthetic value. The great cost, in time lost, nursing, and special medical attendance, of a 50 % attack rate of influenza tends to balance the financial objection to the single bedroom.

Whatever little good can be said for the open dormitory in health—its comparative safety in the presence of fire, for instance—the sick dormitory is a serious menace to the life not only of the school, but of the whole nation. It is unsafe to nurse catarrhal diseases in anything but a single room. To construct sanatoria sufficiently large to accommodate a widespread influenza wave for two weeks and then to lie fallow for the bulk of the year is absurd, and this difficulty of sick housing is most easily met by nursing minor catarrhs in the boys' own single bedrooms, a process which, with careful organization, can be made both economical and safe.

In cases of acute nasopharyngitis it is impossible clinically, in the first few hours, to guess at the ætiology. Most of the boys when admitted had a high pulse-rate and a subnormal temperature which is present in most nasopharyngeal disease before a raised temperature can be detected. For some time both the nurses and myself have worn masks, and I am sure that none of the nursing staff had anything to do with the infection.

It is not safe to assume that organisms discovered in several cases are those ubiquitous throughout the school, but it is, I think, safe to say that those found in the dormitory are common to all the boys there if there is something distinctive about the clinical appearances of the patients. Swabbing is very valuable in sick dormitories, because if one has a suspicion that there is a variety of pathogenic flora in the throats of the occupants of the sick room, the boys should be separated out.

Dr. Dorothea Taylor (Bedales School) said that Dr. Glover had raised a point concerning the different sickness rates of girls and boys, and she wished to refer to Bedales School, as it was a co-education school for pupils of both sexes, who were about equal in numbers and were living in practically the same conditions as to dormitories. At classes, at meals, and at other school functions, the girls and boys met together.

Her impression was that sometimes the dormitories were a source of infection with influenza and measles. As a rule, a case of infection in the boys' dormitories spread to other boys, and after that, there were cases among the girls, so that obviously the spread occurred during the daytime. The sickness rate was about the same in boys and girls.

With regard to the complications which occurred in large epidemics, it was noticeable that these synchronized with the peak—particularly in the cases of otitis media and pneumonia. Her own view had always been that this was owing to an increased virulence of the causal bacteria. It was true, however, that at such a time, crowding was more likely to take place in the sanatorium, and that might be a more likely cause than a change in the virus.

Dr. L. R. Lempriere (Haileybury), said he feared that he would be rather contradictory to two previous speakers as, in the first place, he did not wear a mask when on duty in the school wards, and he had not had influenza once in thirty years: secondly, he wished to say that the "public school vaccine" was intended to combat not influenza, but its sequelæ. Carefully taken statistics extending over four years had proved, at least to his own satisfaction, that the incidence of complications had diminished, as a result of using that vaccine.

The method of spread of infectious disease in schools depended largely on the type and construction of the school. In the only one which he would mention the

dormitories each contained forty-eight boys. Senior boys slept at one end, juniors at the other, and there was a large common bathroom. Each dormitory had three living rooms : upper, middle and junior rooms. In these from twelve to fifteen boys were congregated in the day time, and the other boys were in the studies. The position in sleeping corresponded very closely with that in the house-room, at breakfast and tea and, largely, at games. Therefore, the facilities for infection in the house community varied, and spread took place more readily in house-rooms than in dormitories. In the house-rooms close contact occurred for a considerable time during the day, with a good deal of "ragging" going on between the boys, and in the winter and Easter terms as many boys as possible congregated round the fire, and the windows were closed. In the dormitories, however, the boys were under supervision and went straight to bed, where they were in separate compartments, i.e., there were partitions 3 ft. 6 in. high, with beds on either side, facing inwards, with a 3 ft. interval.

Which was the more likely, from the common-sense point of view, to be a source of infection, the house-rooms, or the dormitories, in which the low partition largely prevented a droplet transmission of infection ?

For thirty years he had been trying to determine and analyse the way in which infection spread. During the last ten years there had been at his school nineteen epidemics—namely, of measles, rubella, mumps and chicken-pox, with over 700 cases in all ; 32 % were traced to house infection (including dormitory and house-rooms); 28 % to class-room infections ; 16% to house or form. In 24 % the source was unknown, these being at the later stages of the epidemic, and the cases had become widespread.

Some cases were missed, i.e., they were not brought under the notice of the medical officer. This was particularly true of rubella and varicella, and in the case of measles the contact was bafflingly short. The very fact that infection was so often widespread was against the idea of the dormitory being the chief factor.

In the nineteen epidemics mentioned, twelve of them affected nine or more houses. In the rubella epidemic all the houses were infected. In measles (four out of six epidemics during ten years), eleven of the houses were infected.

Instances of the preponderance of either house or form infection existed. For example, there was an epidemic of mumps affecting one house only ; on the other hand, fourteen cases of measles affected seven houses, in which form infection accounted for ten of the cases. This last outbreak was noteworthy from the fact that the first case was admitted to hospital within twelve hours of the boy's return to school, and that 125 boys were susceptible. The incubation period was seventeen days.

Of the undetermined infections, measles, rubella, and varicella were about equal at 30%, mumps being much lower, with only 11%. Why was this ? Probably because it was, owing to its situation, very seldom missed.

There was not much difference between the 32% of house infections and the 28% of form infections, and if the various possibilities of close groups of boys in the same house were borne in mind, it became very difficult—to him, indeed impossible— to assign as the chief cause the spread in the dormitory.

Dr. A. L. Sutcliffe (Malvern) said that, considering that the incidence-rate of measles in this country was about 100%, the enormous amount of precaution taken at preparatory schools to ward off that disease seemed to be a great mistake. He had never had any serious complications following measles in any preparatory school children who had been under his observation.

Surgeon Captain May (Royal Hospital School, Greenwich), said that he had a large infirmary of from sixty to seventy beds, and though the cases of various kinds were dotted about, very seldom had he known one boy infect another. Neither did he remember any bed-to-bed contacts; the beds were placed fairly far apart and the ventilation was good.

He agreed with those who questioned whether it was right to prevent the occurrence of such a disease as measles in children aged from 5 to 10 years, as later on when they did get this disease it seemed to be of a much more severe character. He had only lately had an experience of a small outbreak of measles—about twelve cases—nearly all severe in character and necessitating isolation and treatment for six weeks.

Dr. Alice Sanderson Clow (Cheltenham) said that she had collected information concerning thirty-three residential houses attached to various scholastic establishments in Cheltenham, with approximately 2,020 resident pupils. She had found that spread of infection could not, as a rule, be traced to dormitories, but was rather due to close contact in class-rooms and day living rooms, especially in those overheated by radiators, in place of, or in addition to, open fires.

In only two cases had the spread of infection been traced repeatedly to dormitories. In both instances the air-space was sufficient, but the ceilings were low (9 ft. high), whereas in the lofty, airy dormitories of most of the houses in Cheltenham there appeared to be little risk of infection.

The spread of measles in dormitories, which used to be of common occurrence, had practically ceased where the taking of temperatures night and morning was systematically practised, as the transitory rise before the infectious period began was thus detected and the case isolated.

Of the diseases which reached epidemic proportions, she considered that colds and influenza were most important to prevent. The more occasional epidemics of measles, German measles, chicken-pox and mumps, served to confer an immunity which she was inclined to regard as a due equipment for adult life.

Dr. E. W. Goodall said that it would be advantageous to all concerned if someone would summarize the excellent work on this subject carried out during recent years, so as to bring out the instructive points. In comparing the incidence of infectious diseases in different schools, many factors had to be taken into consideration. Dr. Glover had produced statistics which indicated that girls had been attacked by certain infections more frequently than boys. He (the speaker) suggested that this might be a question rather of sex than of environment. For instance it was known that, relatively, whooping-cough was more fatal to girls and measles to boys. Again, in comparing the incidence of infection, the social status of the pupils must be considered. Children from the poorer classes were more likely to have been immunized against these diseases before they went to school than were those of the more well-to-do classes. The structure and lay-out of the buildings and the general arrangements of the school must also be considered. In the only instance in which he had had the opportunity of investigating an outbreak of infectious disease in a large public school, he had come to the conclusion that the crowding of the boys together into small studies out of school hours, for the purpose of discussing among themselves various questions in which they were interested, was the prime factor in the spread of the disease.

Dr. E. P. Poulton referred to a method of preventing nasopharyngeal infection and respiratory catarrh which had been described by him three years ago and had since then been modified. These later modifications would be fully described in a

forthcoming issue of the *Lancet*. The method consisted in the massive application of a simple inert substance (1 part paraffinum molle and 3 parts paraffinum liquidum, with a little menthol added, or not, as required) to the nasal mucous membrane, by means of either a collapsible tube or a nasal pipette.

The method was described to him in 1921 by Mr. Wilfrid Glegg, F.R.C.S., of Birmingham ; hence he, the speaker, thought that the mixture should rightly be called " Glegg's Mixture."

The patient should lie on his back and allow the material to run down the nose, first one side and then the other, until it was felt at the back of the nose, forming a massive covering of the mucous membrane.

Some might think that the same effect could be produced by means of sprays, but sprays consisting of minute oily drops were ineffective in comparison. Other proprietary substances were advertised, but they were not so good because they were too liquid (like mistol), or, if semi-solid (like nostroline), only a minute amount was used.

He urged medical officers of schools to try this out as a preventive measure on a large scale, as it constituted a means of stopping nasopharyngeal and respiratory infections in the early stages. As a test, in a season of colds or influenza, half the occupants of a dormitory should be treated by this means and the other half treated by some alternative method such as vaccination, or left untreated. He personally now seldom had a serious cold, whereas formerly he had had one about every six or eight weeks.

The Chairman said that the chief-point which every speaker had emphasized, directly or indirectly, was the need for an abundance of fresh air in the dormitory, so as to dilute any infection which might be present. Most school medical officers had to deal with the boys or girls under their care in the surroundings in which they found them, but this discussion had suggested the important question as to whether schools were properly planned. He thought that medical officers had been the victims of architects and schoolmasters.

He had been thinking over this matter for a long time, and his hospital at Alton was being rebuilt in a special way, dictated by twenty-five years' experience. It was being so arranged as to secure an infinite amount of fresh air. It would not be a matter of a 3-ft. space between beds ; he wanted the air of Hampshire. He thought that most school and hospital buildings were wrongly constructed. The children, or the patients, as the case might be, were put into closed dormitories or schoolrooms when they ought to be as far as possible in the open air. This open air could be obtained by so constructing dormitories and wards that a sliding roof could be thrown back at once, and the sides could be made to fold away. Thus could germ-laden air be diluted and infection prevented. That was, in part, the plan upon which the new Alton Hospital was being built. One ward, which had been some years in use, did away with the need of removing any patient in order to secure fresh air or sunlight for him. The roof could be made to slide off, and any side, according to the prevailing wind, to fold away ; or all sides, if necessary, could be folded away simultaneously.

With regard to utensils, such as cups and saucers, knives and forks, glasses, bed-pans, etc., it was obvious that all these should be washed after use and then sterilized, because if they were merely washed in a common water and then dried, organisms would remain on them.

As to whether dormitories should or should not be warmed, the children should have comfort, and this could be secured with open-air treatment. To secure warmth there was no need to have radiators and pipes, which collected dust. The proper solution was to return to the old Roman system. It was possible to panel heat part

of the dormitory or ward floor, from which the hot air rose and carried away with it whatever infection there might be.

Dr. Glover (in reply) said that on the question of open-air dormitories he agreed with the Chairman.

He did not fully agree with Dr. Sutcliffe as to the usual harmless nature of measles epidemics in preparatory schools, as he had investigated one outbreak with complications of great severity and some fatality in a preparatory school which had been healthy for years and in which no cause was found for the severe secondary infection.

The possibility of the introduction of a secondary infection by a nurse-carrier, mentioned by Dr. Smith, was important ; to cope with epidemics in schools it was unavoidable that outside nurses should be introduced, and there was, in epidemic seasons, a risk that such nurses might come straight from duty in similar epidemics elsewhere, and so might unknowingly be temporary carriers of epidemic strains of hæmolytic streptococcus.

Surgeon Captain Dudley, in reply, said he agreed with Dr. Goodall that every establishment presented a different complex of environment and type of population. In contrast to a public school, Greenwich Hospital School was inhabited by a population the majority of whom had had measles before entry. In such a case measles would not spread in a dormitory, since the few remaining susceptibles would be insulated from each other by the numerous immunes. Dr. Glover had mentioned the difficulty of getting evidence of bed-to-bed spread in very infectious diseases, such as measles and influenza. Such infections, in contrast to scarlet fever and diphtheria, probably required very short contacts for transmission, and would spread as well, or better, by day than by night. In large dormitories evidence of infection was sometimes suggested by the peaks of the sub-epidemics of influenza in the dormitories being separated by considerable time periods.

The medical officer for Haileybury had wisely warned them against overstressing the importance of dormitory infection, but he himself traced 32 per cent. of his infections to the dormitory. This did not, of course, mean that if he wiped out all dormitory infection he would reduce the sick list to this extent, as many of the cases would become infected later elsewhere, but he would probably " flatten " his epidemic curve and reduce the incidence of complications.

Another speaker had noticed that complications were more frequent at the peak of an epidemic, and attributed this to increase in bacterial virulence. He (the speaker) sympathized with the view that bacterial variation was a factor in such phenomena, but would point out that at the height of an epidemic the number of distributors of bacteria was greater, and increase in severity could be also explained by mass infection. The contrast in the incidence of complications in the more and the less densely populated training establishments, was consistent with the latter view as well as with the former hypothesis.

Someone had said that there was no acquired immunity to colds, but as age or experience increased, the intervals between colds lengthened and they tended to become less severe.

He supposed there must be some special virtue in fresh air, apart from its possible effect in diluting the agents of infection, but the more he studied the subject, the less he could make of it.

With regard to the apprehension expressed by one speaker as to children putting their heads under the bed-clothes—any possible increase in carbon dioxide was harmless in itself ; Navy submarine experience showed this. Animals, moreover,

tended to cover their noses when asleep, as if the stimulus to respiration caused by carbon dioxide was beneficial. He thought the habit was natural and might well be encouraged, as a sheet over the nose and mouth prevented the distribution and reception of infected droplets.

He endorsed the opinion that the inhabitants of institutions should sleep outside them, and the dormitory space thus saved be used to make day rooms more spacious.

Section of Surgery (Sub=Section of Proctology) and Section of Urology.

Chairman—Mr. W. S. PERRIN, President of the Sub-Section of Proctology.

[*May* 11, 1932.]

DISCUSSION ON URINARY COMPLICATIONS OF DISEASES OF THE LARGE INTESTINE.

Mr. Hugh Lett : This paper is based on the records of 172 cases of diverticulitis admitted to the London Hospital during the ten years 1922 to 1931, with the addition of one case of peri-vesical abscess and two cases of vesico-colic fistula treated by me outside the hospital.

Urinary symptoms secondary to the diverticulitis were present in seventeen, roughly 10%, of the 172 cases, so that the incidence is comparatively small.

There were six cases with disturbance of micturition which might reasonably be supposed to be due to peri-cystitis, one case of *B. coli* cystitis, three cases of perivesical abscess and seven of vesico-colic fistula. In addition there were a few other cases which might have been included in the first group, but after careful consideration they were rejected, as their urinary symptoms were possibly due to other causes, such, for example, as enlargement of the prostate.

Peri-cystitis.—All the six cases were admitted with acute diverticulitis. Three of them recovered under medical treatment, two were operated upon for perforative diverticulitis and made a good recovery, while in the third a laparotomy confirmed the diagnosis of diverticulitis, but the patient refused to undergo colostomy. In none could an abscess be detected on clinical examination.

The notes state that three of the six patients complained of difficulty in beginning micturition, one of difficulty and frequency, one of frequency alone and one of pain. In all the urine was clear, with the exception of one in which red cells and a few leucocytes were found and the *Staphylococcus albus* was grown on culture. Cystoscopy when carried out was negative.

This group is interesting, but one cannot lay much stress upon it, for the cases are few and the symptoms slight. It is, however, worth a passing consideration, as illustrating the fact that temporary and slight disturbance of micturition may occur in cases of acute diverticulitis in which no abscess can be detected on clinical examination.

Peri-vesical abscess.—It is probable that the development of a vesico-colic fistula in cases of diverticulitis is nearly always preceded by abscess formation between the colon and the bladder, although the abscess may be small and may not attract attention as such. I have, however, had four cases in which the abscess was large

and obvious. In all of these the predominating symptom was frequent and painful micturition. Pain was felt at the end of the act and was described, in two cases, as burning and cutting, in a third it had recently become excruciating. An interesting feature was difficulty in micturition. One patient had to strain occasionally to pass water, another had had great difficulty for three weeks and a third said that she had some difficulty in beginning the act. It may be noted that four out of the six patients referred to in the previous section complained of difficulty in micturition.

Urine.—In one case the urine was clear to the naked eye but contained red cells and leucocytes. The *Staphylococcus aureus* was obtained on culture. In two cases the urine contained pus and *Bacillus coli communis*. In the fourth case it was turbid, owing to the presence of large numbers of *B. coli*.

Cystoscopy was not carried out in one case but in the other three the appearance was very characteristic. The most striking feature was an intense œdema which was localized to the left side of the fundus of the bladder and extended on to the posterior wall. This œdema was roughly circular in outline and the mucosa was intensely reddened and thrown into thick folds.

In two cases there were numerous villous projections rising from the œdematous area, and in one of these two cases there was some necrosis. The third case was particularly interesting, as the œdema involved the lower half of the posterior wall and extended on to the trigone; this was due to the fact that the abscess was at a lower level than usual and consequently the fundus of the bladder was not in direct contact with the abscess.

These appearances may, of course, be found in any case in which the bladder forms part of the wall of an abscess, and are not peculiar to an abscess secondary to diverticulitis. They indicate that if left untreated the abscess will in all probability ultimately burst into the bladder.

Treatment.—If a patient suffering from diverticulitis develops a perivesical abscess which is so large as to be easily recognized on clinical examination, we have to consider three things—the abscess, the relief of the severe bladder symptoms, and the diverticulitis.

If the abscess is so large that it rises well above the pubes towards the umbilicus, it should be opened and drained through a small suprapubic incision and nothing else should be done. The patient's symptoms will be relieved and the general condition much improved. Some two weeks later colostomy should be carried out —preferably a transverse colostomy.

If the abscess is situated in the pelvis and does not rise above the pubes, a transverse colostomy alone will probably suffice. The patient should be placed in Fowler's position and expectant treatment adopted. In most cases the abscess will gradually disappear. On the other hand, the frequency and pain on micturition may increase, in which case the abscess will discharge into the bladder. If however the patient should not improve and the symptoms suggest extension of the peritoneal inflammation, laparotomy and drainage must be carried out. If the abscess is obviously pointing into the rectum or vagina it should be drained by either the rectum or the vagina according to its position, but in cases of diverticulitis an abscess so low down in the pelvis as to point into the rectum or vagina is exceptional.

As a rule the bladder symptoms will rapidly disappear when once the abscess has been evacuated or—in the case of a low-lying abscess limited to the pelvis—when colostomy has been performed—but in dealing with very debilitated subjects with intensely frequent and painful micturition, particularly if the cystoscope reveals gangrene of the mucous membrane, drainage of the bladder through a suprapubic incision may be necessary to give relief. The ultimate prognosis in such cases is grave.

In one of my cases, owing to the intense pain and frequency of micturition and early gangrene of the mucosa, I drained the bladder through a suprapubic incision in addition to performing transverse colostomy. The patient, a man aged 64, with atheroma and myocardial degeneration, was much relieved, but developed lobar pneumonia and died ten days later. At the post-mortem examination 20 cm. of the pelvic colon were found to be involved and there were multiple abscesses in connection with the numerous diverticula. The main abscess communicated with the bladder by an opening 2 mm. in diameter.

Another case was of considerable interest from the point of view of symptoms and diagnosis. The patient was a woman aged 67. For the last year she had had attacks of sickness and diarrhœa at intervals of three months, and was rather constipated. Eight weeks before I saw her, while wringing out clothes, she had had sudden severe pain in the vagina and lower abdomen. A dull aching pain persisted and was aggravated by walking or sitting. Ten days after the pain began, great frequency of micturition by day and night developed and she had some difficulty in beginning the act. These symptoms persisted and distressed her greatly. Throughout the eight weeks she had had irregular pyrexia. Abdominal examination revealed tenderness in the hypogastrium, extending to the iliac fossa on either side. On pelvic examination a tender œdematous swelling was felt extending across the pelvis in front of the uterus and to the left of it, and also in Douglas's pouch. Skiagrams showed the presence of numerous small diverticula and that the pelvic and iliac portions of the colon were considerably narrowed (figs. 1 and 2). On cystoscopy,

FIG. 1.   FIG. 2.

the bladder only held 5 oz. of fluid ; there was general cystitis with intense œdema of the lower half of the posterior wall, extending on to the trigone. Transverse colostomy was performed in February, 1928, and was followed by rapid recovery and relief from all the symptoms. A year later, in February, 1929, she had no symptoms, vesical or intestinal, but there was much fibrous thickening in the pelvis.

In March, 1932, four years after the operation, the bladder was normal and held 10 oz. ; the urine was quite clear, but cultures yielded *B. proteus.* The uterus was

rather fixed but the fibrous thickening had disappeared. A barium enema flowed freely from the rectum to the colostomy opening and escaped so quickly that X-ray examination was difficult, but although the bowel could not be distended, the outline of the diverticula can still be seen. This skiagram is also of interest as showing the appearance of the colon four years after colostomy (fig. 3).

The patient said she was so well and comfortable that she would not undergo any further operation even if one should be thought desirable.

Vesico-colic fistula.—The two generally recognized causes of vesico-colic fistula are diverticulitis and carcinoma. Either condition may cause this fistula and there may be considerable difficulty in distinguishing between them, even when the mass is exposed and examined at the operation. It is well known that many cases originally labelled carcinoma of the pelvic colon made such a good and permanent recovery after a colostomy had been performed that with the lapse of years the original diagnosis was proved to be wrong and the title of the case was changed to diverticulitis.

FIG. 3.

A vesico-colic fistula was present in 7 of the 172 cases—roughly 4%. Only three other cases of vesico-colic fistula were admitted to the hospital during these ten years ; one was secondary to carcinoma of the pelvic colon, in the other two the cause was not determined, but there was no X-ray evidence of diverticulitis.

During the ten years in question, 96,192 patients were admitted to the surgical wards of the hospital, so that these ten cases of vesico-colic fistula from all causes represent a proportion of roughly 1 in 10,000.

These figures illustrate the rarity of vesico-colic fistula among surgical conditions in general, and also support the generally accepted belief that when a vesico-colic fistula occurs, it is usually a complication of diverticulitis, and only occasionally results from extension of carcinoma of the colon. But in malignant disease of the colon a fistula between the intestine and bladder is a late development, and by the time it has formed the patient may be so ill that he is generally referred to an infirmary and not admitted to the wards of a general hospital.

In collecting the cases which are the subject of this report, the hospital records have been scrutinized with great care, and no case has been accepted as one of vesico-colic fistula unless there was satisfactory evidence that gas or fæces or both had been passed per urethram and that the colon was the part of the bowel affected. Cases of fistula between the small intestine and the bladder, and between the rectum and the bladder, have been excluded.

Sex.—As stated above, among the 172 cases of diverticulitis there were 17 cases with some form of urinary disturbance, and it is interesting to note that although the sexes were represented in these 172 cases by 95 men and 77 women, urinary complications occurred much more commonly in men, in the proportion of 13 to 4, and only one of the seven instances of vesico-colic fistula occurred in a woman. The difference between the pelvic contents in the two sexes, that is to say, the presence of the uterus and its appendages in the female, offers a ready explanation.

Age.—The age of the patients in the eleven cases of vesico-colic fistula varied from 33 to 64 with a mean average of about 51, but this point does not appear to be of any importance.

Previous history.—The previous history, so far as can be gathered from the notes, was the usual one of diverticulitis, characterized by abdominal pain, fever, and constipation or diarrhœa, and is of no particular interest apart from the long duration of the disease in some instances. Several patients had suffered from periodical attacks of abdominal pain for a number of years—one of them for eight years, a second for seven years and a third for five or six years. Another patient had had attacks for three years. His case is of interest, as during the year before the formation of the fistula he had been operated upon by Mr. Souttar for acute fibrinous peritonitis; the abdomen was closed without drainage and a good recovery followed. The other patients had had abdominal pain with exacerbations for periods varying from four to twelve months. The pain was situated in the hypogastrium and in some cases was felt also in the left iliac fossa. Two patients complained of pain on defæcation. Constipation was a pronounced feature, but in some cases this was replaced, after a time, by diarrhœa, with or without tenesmus. In a few instances diarrhœa alone was mentioned without reference to any previous constipation. Prolonged pyrexia with sweating at night and loss of weight was usual. It is worthy of note that the abdominal pain and other symptoms were more or less constant for several weeks or months up to the time of the development of the fistula.

Development of the fistula.—The earliest manifestation of the fistula varied in different cases. One patient who had suffered for a long time from dull, aching, suprapubic pain noticed that it suddenly disappeared. On the same day he passed pus in the urine and noticed shortly afterwards that the motions and the urine were of the same consistency. His doctor reported that the urine contained fæcal matter, coagulated blood and pus. Some patients had pneumaturia only, air was felt passing down the urethra during and after micturition, bubbles were seen in the urine and froth was left round the meatus at the conclusion of the act. In others fluid fæces were passed.

An interesting sequence of events occurred in a private case not admitted to hospital. The patient, a man aged 54, had had constipation for three or four months, associated with high pyrexia for at least two weeks. Nine days before I saw him he had had pain and frequency of micturition, with pus in the urine; three days later there was slight hæmaturia, followed two days later by pneumaturia; two days after this, little particles appeared in the urine. Subsequently the urine contained fæcal matter discoloured by bismuth which had been prescribed for him. In another personal case in which the fistulous opening was a very small one, the pneumaturia was most noticeable during the first act of micturition after waking in the morning.

Condition on admission.—The predominant symptoms on admission to hospital

were urinary. Micturition was very frequent—in a large proportion of cases as often as every hour by day and night. Pain occurred during and at the end of the act. The pain was described as burning or scalding and was felt in the hypogastrium and also, in some cases, at the meatus on completing the act. One patient, on the other hand, volunteered the statement that the aching pain in the hypogastrium was relieved by micturition. One patient had recently noticed a swelling in the left iliac fossa associated with a gurgling pain. From time to time this swelling would disappear, when the gurgling pain was replaced by a " terrible pain " in the left testis or rectum. This was relieved by passing flatus per urethram or per rectum.

Urine.—The diagnosis of vesico-colic fistula can only be made on the evidence of gas or fæces being passed in the urine. As already mentioned, gas may be felt passing along the urethra, it may be seen as bubbles in the urine as it is passed, or as froth remaining at the meatus at the conclusion of micturition. Fæces may appear in the urine in small solid particles or as fluid fæces, brown in colour ; one patient who had suffered from severe diarrhœa for several months said that the deposit was greenish brown. Another patient who had had diarrhœa for four months said that " the front and back passages were mixed up." Certain drugs may be found in the urine, as in the case of two patients in this series, one of whom was taking liquid paraffin and the other taking bismuth.

Blood may be present at first as an occasional terminal hæmaturia, or in a very small amount only to be detected by microscopical examination ; pus is present of course, and the *B. coli* appears to be found constantly, with other intestinal flora, if the fistula is a large one and fæces enter the bladder.

Cystoscopy.—The findings on cystoscopy vary with the stage at which the examination is made and may be grouped under three headings.

(1) In recent cases there is acute general cystitis with a circumscribed red œdematous area usually found on the left of the fundus and the upper part of the posterior wall. The œdema may be so pronounced that the mucous membrane is thrown into folds and it may even show a number of papillomatous projections. These appearances correspond with those found in cases of peri-vesical abscess, and the œdema may prevent the opening of the fistula from being seen.

(2) If the fistula has been present for some time and the opening is only small, the cystitis gradually becomes less acute, the œdema disappears and is ultimately replaced by a small ulcerated area, while the rest of the bladder appears to be normal. In a case under the care of Mr. Neligan there was " a small ulcerated area at the top left-hand corner of the bladder, which was drawn up." Pressure over the hypogastrium caused a worm of pus to pass through this ulcerated area and enter the bladder, in much the same way that paste can be expressed from a collapsible tube. The rest of the bladder appeared to be normal.

(3) When the fistula has closed, a diverticulum may be left in the position of the fistula. This is shown in the accompanying illustration made by Mr. Thornton Shiells from a case under the care of Mr. Walton. (Fig. 4.) The diverticulum is obviously produced by traction, and its appearance is quite different from that of the usual type of bladder diverticulum. The mucosa is thrown into folds, and is slightly injected. The position of the diverticulum is also characteristic. (Fig. 5.)

X-ray examination.—The shadows thrown by the barium in the large bowel make it very difficult to demonstrate the fistula by X-rays after giving a barium meal or enema, and none of the skiagrams at my disposal suggested the presence of a fistula. It is possible, however, that if instead of a barium enema being given, the bladder were filled with an opaque fluid and cystograms taken, some evidence of the fistula might be obtained.

Sigmoidoscopy.—As a general rule, the size of the inflammatory mass in the pelvis prevents the sigmoidoscope from being introduced further than about six

inches from the anus, so that the result is negative. In cases of carcinoma, on the other hand, the edge of the growth can usually be seen. The presence of blood in the lumen of the bowel is suggestive of carcinoma, although it is sometimes found in cases of diverticulitis.

Treatment.—Once a vesico-colic fistula has formed, nothing short of a colostomy can be expected to close it, and although, from time to time, the symptoms may

FIG. 4.—From an illustration by Mr. Thornton Shiells.

FIG. 5.—From a sketch by Mr. Thornton Shiells.

disappear under medical treatment and lead to the hope that the fistula is permanently closed, recurrence will take place sooner or later with few exceptions, as in the following case :—

The patient, a man aged 60, had had symptoms of diverticulitis for five or six years. (Fig. 6, p. 144.) For six weeks he had had pneumaturia, irregular pyrexia, and frequency of micturition, with great pain and urgency. He declined to undergo colostomy and was treated by liquid paraffin, urinary antiseptics and so on. . . . Three months later he was

much better and the fistula had evidently closed, for the pneumaturia, pain, and frequency had disappeared, and although the urine was still hazy it no longer contained pus visible to the naked eye. The symptoms recurred however within two months and the fistula was re-established. The patient still refused to undergo operation and I lost sight of him. I heard later that colostomy was ultimately performed but the patient only survived for five or six months.

If a colostomy is carried out, the bladder symptoms usually disappear rapidly and within two or three weeks the urine becomes normal, apart from a haze due to bacilluria ; if, however, the fistulous opening is a large one it may persist in spite of colostomy.

Whether the colostomy should be inguinal or transverse is a point which may be discussed with advantage. In many cases inguinal colostomy gives excellent results, but in others a transverse colostomy is the operation of choice. If
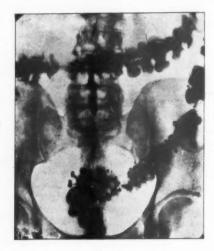

FIG. 6.

the greater part of the pelvic colon is involved in an inflammatory mass, the difficulty and danger of bringing a loop on to the surface of the abdomen may be so great as to make it inadvisable. A transverse colostomy is also to be preferred if the affected area encroaches on the proximal part of the pelvic colon to such an extent that there is only a little healthy intestine between it and the colostomy. The presence of multiple diverticula in the descending colon is a third indication for carrying out a transverse colostomy, for although the free evacuation of the contents of the descending colon which follows inguinal colostomy minimizes stasis, and so reduces the risk of inflammation in these diverticula, it does not entirely remove that risk.

Recurrence.—A colostomy does not always lead to a permanent closure of the fistula. In at least two of the seven hospital cases and possibly in others which could not be traced, the fistula recurred, with further evidence of pelvic inflammation. In one of these the patient died : but the other patient, who was under the care of Mr. Walton, recovered. After ten weeks' pyrexia, and a return of the fistula, which persisted for seven or eight weeks, an abscess found its way to the surface and discharged through the lower part of the colostomy wound,

with complete relief of symptoms.   At the present time the patient is very well and the urine is clear, although a para-colon bacillus has been obtained on culture.

In considering the possible causes of recurrence, it is reasonable to suppose that if the fæces are not entirely diverted through the colostomy opening and if some small quantity occasionally passes on through the distal opening, this will predispose to a recurrence of infection and return of the symptoms.   It is therefore advisable to close the distal opening of the bowel when the colostomy is performed.

Resection.—This is admittedly a formidable and dangerous operation and the difficulties and risks attendant upon resection during the acute stage are with few exceptions too great to justify this operation.   If, therefore, resection is proposed, a considerable interval should elapse before it is carried out, in order to allow the acute inflammation to subside and some of the pelvic thickening to disappear.   But even then it is questionable whether the operation is justifiable, unless the whole of the affected part of the colon can be removed.

In the event of recurrence of symptoms with a return of the fistula, after colostomy, resection should always be considered, for the colostomy has failed and the ultimate prognosis is grave if nothing further is done.   If, happily, only a small part of the pelvic colon is affected and an end-to-end anastomosis appears feasible, resection may reasonably be undertaken, and the colostomy opening closed either at the same operation or at a later date.

I have to thank my colleagues at the London Hospital for permission to quote their cases, Dr. G. E. Vilvandré for the skiagrams, and my first assistant, Mr. Edgar Freshman, for his help in examining the hospital notes.

Mr. Cyril A. R. Nitch.—The urinary complications associated with diseases of the large intestine are due to direct involvement of some part of the urinary tract, either by the spread of inflammation, by adhesion, by invasion, by growth, or by fistulous communication.   The kidney is rarely implicated, owing to its protective barrier of fat and fascia, and perinephritis and perinephric abscess are much less common than might be expected.   I have never seen a direct renal complication, even with massive overlying diverticulitis or growth.

There can be little doubt that the ureter is sometimes compressed and obstructed, but the clinical evidence is slight, for the obstruction is so gradual that, provided the opposite kidney is healthy, the affected one becomes functionless without any noticeable signs or symptoms.

An inflammatory mass overlying the ureter could give rise to bacilluria and pyuria, a complication I have seen once from an adherent, gangrenous pelvic appendix, but although the urinary infection cleared up shortly after removal of the appendix and had probably been by direct extension, the hæmatogenous and lymphatic routes could not be excluded.

Bladder symptoms occur more frequently with diverticulitis of the pelvic colon than with rectal or colic growths, and in a small proportion of cases are the first indication of the disease.   This applies also to dysenteric ulceration, of which I have seen one case, and to a pelvic appendix which is sometimes adherent to the bladder. In the light of accumulated knowledge it is possible to state that the combination of bladder and bowel symptoms is almost pathognomonic of an inflammatory cause.

In a series of 20 cases of diverticulitis of which I have complete notes, 50% had definite urinary symptoms and seven (35%) had vesico-colic fistula, whereas in 165 cases of carcinoma of the colon (67) and rectum (98) the urinary symptoms were almost negligible and fistula was present in only four (2·4%).   Of course these figures are not large enough for reliable deductions, but I think the figures of others will not be very dissimilar.

Bladder symptoms range between disorders of micturition, cystitis and intermittent or established vesico-colic fistula.

The chief disorders of micturition are urgency and frequency, which are also painful when the inflammation is acute, and are sometimes accompanied by suprapubic pain—an important symptom, as it seldom occurs with a purely vesical lesion. Other disorders are dysuria, sometimes ending in retention, and occasionally nocturia simulating prostatic obstruction.

At first the urine is clear and the cause of the frequency or pain may be puzzling, but as the invasion of the bladder progresses the characteristic signs and symptoms of cystitis set in. These may clear up if the cause is recognized and yields to treatment, but more often they are the precursors of a vesico-colic fistula. The cystoscopic appearances in the pre-fistulous stage are characteristic, ranging from a zone of hyperæmia on the roof of the bladder to a circumscribed area of swollen œdematous mucous membrane, often with a slough or a cone-shaped depression in the centre, indicating impending perforation.

The fistula, when once established, is generally permanent, but may be intermittent, and may even close spontaneously. It is generally due to massive adhesion, but in a case reported by Garnett Wright the communication was through an adherent appendix epiploica alone.

The history of seven cases of fistula due to diverticulitis is of interest :—

In one the fistula had been present for five months, and closed spontaneously after a few weeks treatment with olive oil by rectum and liquid paraffin by mouth. The second developed a few days after operation for acute obstruction, and the patient died a week later. The third formed ten days after drainage of an iliac abscess, became inactive after colostomy, and has remained so for eleven years. The fourth was in a female, had been present for eighteen months, and became inactive after colostomy. The fifth patient was alive and well eight months after colostomy, but the fistula was patent, as some urine escaped through the colostomy during micturition. The sixth was in a man, then aged 82, who was relieved by a colostomy eleven years ago, but the communication has not closed, as ever since the operation urine has escaped from the colostomy during micturition. In spite of this and of a chronic cystitis with occasional stone formation, the patient, now aged 93, is in excellent health. The seventh remained inactive and apparently closed, as six years after colostomy the patient was in perfect health.

My registrar, Mr. Lee, looked up the records of St. Thomas's Hospital, and found that in the ten years from 1922 to 1931 inclusive, there were only twelve cases of vesico-colic fistula, eight in males and four in females. Three were secondary to carcinoma of the rectum, three to carcinoma of the sigmoid, one to carcinoma of the cæcum, and one to carcinoma of the bladder. Of the non-malignant, two were due to diverticulitis, one to tuberculous vesiculitis, and one followed hysterectomy. If these figures are arranged differently, we find that in 754 cases of carcinoma of the colon and rectum there were only seven (a little over 1%) with vesico-colic fistula, whereas in 73 cases of diverticulitis there was a fistula in two (2·7%).

The treatment of vesico-colic fistula should be cautious, and in most cases conservative, for a considerable time. A preliminary cystoscopy should always be carried out in order to ascertain the position and size of the opening and its possible cause. If this be intraperitoneal, the abdomen is opened and a careful examination made, with as little disturbance of the pelvic contents as possible, with a view to determining the possibility of separating the bowel and the bladder at a later date. A colostomy is then performed. In most cases it will be best in the transverse colon, but in some the inguinal operation may be preferable. If the fistula is due to a growth which is considered removable, the excision should be carried out as soon as the artificial anus is properly established, but if it is due to diverticulitis a year or eighteen months should elapse before any attempt at resection.

It is both remarkable and fortunate that prostatic obstruction is a rare complication of carcinoma of the rectum. When it occurs its treatment depends entirely on the nature of the growth. If the carcinoma be inoperable, and therefore only relievable by colostomy, an indwelling urethral catheter should be used until the

artificial anus is functioning properly. If normal micturition is not re-established after removal of the catheter, there are four alternatives : (1) regular catheterization by the patient himself or by an attendant ; (2) the removal of obstructing prostatic tissue by per-urethral endothermy, an operation which is becoming more successful with the improvement in the special instruments ; (3) perineal drainage with a self-retaining catheter inserted through the bulbous portion of the urethra, and finally, as a last resort, suprapubic drainage.

If the rectum has been excised and the prognosis is considered good, the choice lies between per-urethral endothermy and perineal prostatectomy. Provided that the post-operative scar tissue behind the bladder is not excessive and that the prostate can be pulled down to the perineum by the prostatic tractor, then the perineal operation is undoubtedly the better of the two alternatives, for endothermy may have to be repeated several times and also may be followed by hæmorrhage and sepsis, for which the very operation it is most desirable to avoid—that is suprapubic cystostomy—may be necessary.

Mr. J. P. Lockhart-Mummery: I shall not attempt to discuss or classify the various urinary complications, but will limit my remarks to a few with which I have had special acquaintance.

Urinary complications following, or resulting from, operations for excision of the rectum.—(1) Retention of urine.—This is a constant source of trouble, though it is, of course, a comparatively minor one, and only very seldom of serious import—and then usually only as the result of a complicating enlargement of the prostate gland. It is, however, a complication which not infrequently causes the patient a good deal of distress and retards rapid recovery from the operation, so that we should do all in our power to eliminate it.

Removal of the rectum must inevitably result in a certain amount of injury to the sympathetic nerve supply of the bladder and, with few exceptions, retention of urine, either partial or complete, is an inevitable result of the operation. For a time we relied upon regular catheterization, but this proved unsatisfactory, and generally resulted in infection. I think this was not because the catheterization was badly done, but because the bladder, after excision of the rectum is, for some reason, peculiarly liable to infection The next step was the tied-in catheter. It is now my practice, and I believe that of most surgeons, to use a tied-in catheter for from three to five days after operation, and lately this has been used in combination with Dr. Cuthbert Duke's apparatus.[1] This apparatus allows the whole of the catheter system to be kept full of weak antiseptic, and it has, in my opinion, been of great service in preventing infection and making the patient more comfortable. Unfortunately, partial retention is liable to occur after the catheter has been removed, with the result that, in spite of the fact that the patient is passing urine for himself, accumulation in the bladder takes place, with all the attendant risks of infection. This is very easily overlooked, as the amount of urine passed during twenty-four hours is no guide, and this is often all that the nurse or the medical attendant looks to. In my opinion, residual urine causes most of the infections, and I think infection is quite rare apart from some amount of residual urine. In a few cases many weeks may elapse after operation before the patient is able to empty the bladder completely for himself, and it is in such cases that infection is liable to occur. The present urinary antiseptics are, I consider, useless, either to prevent or to treat bladder infections. At St. Mark's Hospital, where very careful tests are made of the urine in order to detect infection, we find we are fairly successful in preventing it in men, but that infection in women is still the general rule. The infection is seldom serious, but it is often a long time before it is entirely eradicated.

[1] For an illustration of this apparatus see *Proceedings*, 1928, xxii, 265 (Sect. Surg., Sub-Section Proct., 7).

With regard to the method of treating it, the first thing to do is to get the patient really to empty the bladder ; this is often impossible until he is able to get up. Apart from this, washing out the bladder regularly is often a great help.

(2) Incontinence of urine.—I have never yet seen a case of complete incontinence following excision of the rectum. I have had two cases of nocturnal incontinence following that operation, both in men ; in one case this symptom lasted for six weeks, and in the other for two months. Both patients completetly recovered. I should like to know how this symptom can be accounted for.

Injuries caused by operations on the rectum.—(1) Injuries to the urethra. These are uncommon in my experience and are not serious if properly treated. A catheter tied into the bladder and a careful repair of the injury with stitches results in perfect union, and there should be no subsequent trouble if care is taken to see that no narrowing of the urethra occurs. I have never seen a case in which any permanent trouble resulted from injury to the urethra during excision of the rectum.

(2) Injuries to the bladder.—I have on several occasions, either intentionally or accidentally, damaged the bladder while performing excision of the rectum for cancer. The injury is most likely to occur when the growth is adherent, or involves the vesiculæ seminales in front. In attempting to keep outside the tumour and reach the peritoneum, one is very liable to open the bladder. The same also applies when what corresponds to Douglas's pouch in the female has been obliterated by adhesions from an anterior growth in the rectum. On one occasion, in order to remove the growth, I was obliged to remove most of the posterior wall of the bladder. In my experience these injuries to the bladder have always healed satisfactorily. In a few cases there has been temporary leakage for a few days or weeks, but in most cases there has been prompt healing, without any leakage. Needless to say, a tied-in catheter is kept in place for at least fourteen days, and the wound is drained especially carefully.

(3) Injuries to the ureter.—These are much more serious. Although I have now performed over 300 perineal excisions of the rectum, I have never injured a ureter by this operation, and I do not think there is any danger of doing so. On the other hand, with the abdomino-perineal excision there is a definite risk of injuring the left ureter, especially when the growth is somewhat adherent on the left side. Mere inspection of the ureter is not always sufficient. I have seen the ureter pulled out into a loop by contraction of fibrous tissue round the growth, and I have no doubt that occasionally such a loop gets cut off in removing the growth, although the line of the ureter seems to be quite correct. At one time I thought this difficulty could be surmounted by catheterizing the ureters previous to operation, but I soon found that in those cases in which the ureter was kinked or displaced from its normal position—in fact, just those cases which it was in danger of being injured— a ureteral catheter could not be passed. The only safe way of avoiding the ureter is to define it during operation, and this must not be done too thoroughly or its blood-supply may be damaged. I have seen four cases of injury to the left ureter as the result of abdomino-perineal excision. In three of these the injury was not detected at the time of operation and immediate repair, or transplantation into the bladder, was not possible. In one case the left kidney had to be removed. In two others, after consultation, it was decided to ligature the ureter above the site of injury. In one of these two cases the patient died from uræmia, but in the other the patient recovered without any symptoms at all. In the fourth case I divided the ureter in removing rather a large growth from the abdomen, and discovered the damage at the time. The operation had been a long one and the patient was not in a fit condition to justify implantation into the bladder. Repairing the ureter was not possible, as about one inch of it was involved in the growth. I, therefore, ligated both ends. The patient made a perfectly good recovery and the left kidney was never even palpable. I believe that ligature of the ureter is a sound procedure,

provided that both kidneys are healthy and uninfected, but it is very dangerous in the case of an infected kidney.

Vesico-colic fistulæ.—These fistulæ are practically confined to the male sex and may arise in several ways :—

(1) As the result of accidents or operations : (2) from inflammation or abscess of the colon, as in cases of diverticulitis ; (3) from tumours, either of the colon or rectum ; (4) from ulcers in either the colon or rectum ; (5) from foreign bodies perforating from either organ.

The first symptom is usually the passage of flatus with the urine. This is generally followed by an acute cystitis and the passage of fæcal matter in the urine. The symptoms are often very severe, although the bladder in time becomes extra-ordinarily tolerant to a gross infection, and the cystitis subsides even when the fistula persists.   Escape of urine from the rectum no doubt also occurs, but is very seldom observed as a definite symptom. It is either not noticed or the urine is re-absorbed again from the colon. It is only when the hole in the bladder is a large one that urine is definitely found to escape from the rectum.

There is always something peculiarly unpleasant to the mind about the escape of any secretion or excretion by an unusual or incorrect passage, and it is, therefore, not surprising that vesico-colic fistulæ should be looked upon as an especially alarming condition.   So far as I am aware, the first series of cases was collected by Harrison Cripps ; since then, a number of different series have been published, notably by Chavannaz, who collected 95 cases and found that 24% were due to malignant disease.   Mailer collected 100 cases of diverticulitis, in 14% of which vesico-colic fistula developed.   My own figures are four out of 87 cases.   The commonest cause of such fistulæ appears to be diverticulitis of the colon.   It may result either from a diverticulum becoming adherent to the bladder and ulcerating through into it, or from an abscess outside the colon becoming adherent to the bladder, and bursting into this viscus.   The latter is the more serious condition, as it results in very sudden and serious infection to the bladder.

There is in these cases a grave danger of carcinoma developing in the sinus.   I have come across a number of cases in which this has occurred two or three years after the onset of the original symptoms, and in which there was every reason to believe that no carcinoma existed at the time when the perforation took place.

With regard to the treatment of these cases, it is generally agreed that immediate colostomy is indicated.   In a few cases it may be possible to detach the colon and repair the damage to the bowel and the bladder, with free drainage, and, in my experience the opening in the bladder usually closes up after the establishment of a colostomy, and the cystitis clears up fairly easily.   In a few cases it may be possible subsequently to remove or short-circuit the damaged portion of the colon and repair the hole in the bladder.

Mr. Lionel E. C. Norbury, F.R.C.S. : I propose to confine my remarks to two aspects of the subject under discussion : (1) Post-operative urinary com-plications ; (2) vesico-colic fistula.

(I) *Post-operative urinary infections.*—Predisposing causes : (*a*) Injury to pelvic nerves.—Urinary complications frequently follow certain operations on the rectum, in which, of necessity, the nerve-supply to the bladder must often be seriously interfered with.   This is especially the case in excision of the rectum, where this organ, together with surrounding cellular tissue, etc., is widely removed, and where the prostate-seminal vesicles, etc., are encroached upon and often partly removed or damaged.

It is a physical impossibility to remove the rectum without damaging the nerve-supply of the bladder to a greater or lesser degree.   Without doubt, careful handling of tissues during the operation will tend to minimize this risk.   The result is either

atony of the bladder wall, with stagnation of urine, or spasm of the sphincter vesicæ with retention, in either case a precursor to microbic infection.

A few words of anatomy may not be out of place at this juncture :—

The nerves supplying the bladder are derived partly from the pelvic plexus of the sympathetic and partly from the 3rd and 4th sacral nerves. The pelvic plexus of the sympathetic, or inferior hypogastric plexus, is situated at the sides of the rectum in the male, and at the sides of the rectum and vagina in the female. Numerous branches are distributed from this plexus to the pelvic viscera. The vesical plexus arises from the fore-part of this plexus. The nerves comprising it are numerous and contain a number of spinal nerve fibres. It will therefore be seen that, anatomically, such nerve fibres must be extensively damaged when carrying out modern operations for removal of the rectum.

(*b*) Another predisposing causative factor is the difficulty many patients experience in passing water—often for several days—after rectal operations. This is, no doubt, partly a reflex and is a common occurrence after minor operations such as removal of piles.

(*c*) Infection due to catheterization.—The use of a catheter both at the time of operation to serve as a guide, in the case of a male, and subsequently in both sexes, undoubtedly predisposes to infections of the urinary tract, and is the main path by means of which micro-organisms reach the urethra-bladder and higher portions of the urinary tract. Urethritis and cystitis, pyelonephritis, or even pyonephrosis, may result.

Frequency of urinary infection after excision of the rectum.—This is, unfortunately, a common occurrence. It is nearly always a sequel in women, and quite common in men, even in spite of the most careful prophylactic measures.

Previous urinary disease and stagnation of urine, such as is present in cases of enlarged prostate, are further predisposing causes. The infection usually occurs within a week of the operation and is often preceded by a rise of temperature (*see chart*), after which pus is found in the urine.

In women, this risk of infection is obviously greater than in men, since the catheter, before entering the bladder, often has to traverse a region contaminated by discharges from the operation wound.

Symptoms are often absent in such cases of urinary infection. Routine and frequent examination of the urine for pus is essential in order to establish a diagnosis and to gauge the severity of the infection. Pus may disappear from the urine in from four to five weeks but, on the other hand, bacilluria may continue for very much longer.

The period necessary for catheterization.—This depends on several factors, some of which have been already mentioned, namely : (1) Atony of the bladder, due to interference with the nerve supply. (2) Associated cystitis. (3) Habit.
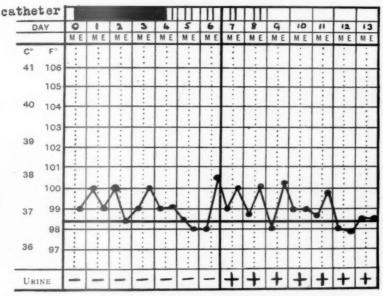
There is no doubt that in certain cases, especially in the female sex, a catheter habit is soon acquired, and the patient will make no effort to empty the bladder herself. In such cases, the patient seems to have forgotten how to pass water, and has to undergo a course of re-education in this function.

To illustrate this point, I may mention the case of a woman, aged 64, whose rectum I removed by abdomino-perineal excision. Regular catheterization several times a day was necessary for a period of three or four weeks after operation, before the normal act was restored. Only a mild urinary infection occurred in this case. Another patient, Mrs. W., aged 53, upon whom also I had carried out abdomino-perinæal excision of the rectum, was unable to pass water naturally for about three weeks after operation, so that frequent catheterization was necessary. A severe urinary infection followed, with much pus and the formation of a large left-sided pyonephrosis, which I drained twenty-three days after the original operation. The normal act of micturition was soon re-established. I have another patient, a woman, aged 57, whose rectum I removed on March 17, 1932, by perinæal excision.

The operation was followed a few days later by severe colicky pains in the pelvic region, along the lines of both ureters. The pain soon subsided, but pus was present in the urine, associated with marked pyrexia. Catheterization was necessary for about three weeks after operation, before the normal act of micturition was restored.

Preventive treatment.—At St. Mark's Hospital preventive treatment after excision of the rectum, has been attempted in male patients, and often with great success, by means of an indwelling catheter, the outer end of which is sealed by an antiseptic solution. In other words the catheter is connected with an apparatus

Cystitis following excision of the rectum. Male, aged 64. The infection of the urine on the seventh day was preceded by a sharp rise of temperature.

for frequent irrigation of the bladder with a 1 to 5,000 solution of oxycyanide of mercury, as devised by Dr. Cuthbert Dukes.

The problem is different in female patients, among whom the incidence of post-operative urinary infection is considerably greater. Such infection is without doubt very largely the result of catheterization.

A consideration of the subject of post-operative urinary infection is of the first importance, since it is only in this way, by an interchange of ideas and experience, that knowledge regarding the ætiology of such conditions can be advanced and sound principles of treatment, both preventive and otherwise, be established.

Vesico-colic fistula.—I have had two cases of this condition, one following diverticulitis of the pelvic colon and the other following carcinoma of the pelvic colon.

The first occurred in a middle-aged man, who was passing large quantities of gas and fæcal matter per urethram. Abdominal exploration revealed a large inflammatory mass, involving the bladder. A transverse colostomy was performed, and at the same time the bladder was drained by suprapubic cystostomy.

The patient made a good recovery; the suprapubic wound healed spontaneously, but of course a permanent colostomy was left. I examined this patient a year or eighteen months afterwards and he was in excellent health, but the pelvic colon had contracted and it was found impossible to close the colostomy.
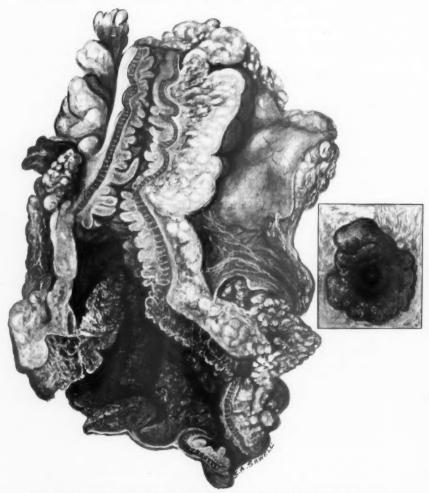

FIG. 1.—Vesico-colic fistula (natural size). Portions of pelvic colon and bladder resected for carcinoma originating in the bowel. Inset: fistulous opening.

The other case was one of a woman, aged 45, suffering from carcinoma of the pelvic colon, who developed cystitis, with passage of gas per urethram. Abdominal exploration, May 18, 1928, revealed an extensive growth of the pelvic colon, involving the bladder. Transverse colostomy was performed, and some temporary relief of symptoms followed. The cystitis continued, however, with passage of most irritating

mucopus, and was accompanied by considerable frequency and pain on micturition. Although the condition was inoperable, I thought it justifiable to remove a portion of pelvic colon, rectum, and bladder, in order more effectually to shut off the fistulous communication which was well shown by means of a barium enema, administered through the colostomy (see figs. 1 and 2). This was done on October 15, 1928, five months after the previous operation. The bladder was drained temporarily and the wound healed. Microscopical examination showed the growth to be a colloid carcinoma. The patient had considerable relief from symptoms for 11 months, but micturition
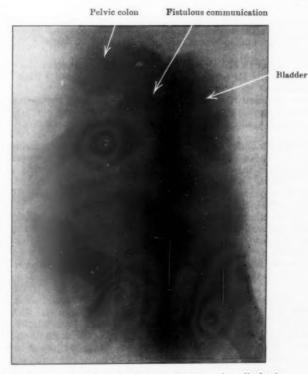

Fig. 2.—Barium enema through colostomy showing vesico-colic fistula.

again became more frequent, and a large quantity of pus was present in the urine. The colostomy was acting well and the general health was good. A course of X-ray treatment had been given during the interim. On October 17, 1929, i.e., twelve months after the previous operation, the patient was re-admitted with a recurrent growth in the abdominal scar. A large mass could be felt in the suprapubic region and also high up per rectum. The edge of the liver also was palpable. Radon seeds were inserted into the growth as much as possible, but with only temporary benefit.

Bladder symptoms are not at all infrequent in cases of diverticulitis of the pelvic colon, the result of inflammatory adhesions between these two structures. One or more diverticula may form a fistulous communication with the bladder, the result of ulceration or gangrene, or again, a diverticulum may perforate, with the formation of

a localized abscess between the colon and bladder wall, the abscess finally discharging into the bladder.

One would expect that such a fistulous communication would heal, after colostomy, in the case of diverticulitis, with immediate relief of symptoms, but this is obviously not so in the case of a malignant growth, where the disease is progressive. The passage of fæces may be diverted, but a fistulous track will remain, accompanied by severe cystitis.

In certain cases following diverticulitis, it has been found necessary to close the fistula after a temporary colostomy, by resection of the affected portion of colon and suture of the opening into the bladder. Vesico-colic fistula is apparently not a very common sequel to disease of the colon. I think it is generally agreed that diverticulitis is responsible for the majority of cases, although even at operation such cases are sometimes mistaken for malignant disease (see figure). The two conditions may co-exist.

A primary growth of the bladder or prostate may involve the rectum by direct extension, with the formation of a recto-vesical fistula, but I have no experience of this complication.

Urinary complications may follow an attack of acute appendicitis, the inflamed diverticulum becoming adherent to the ureter or bladder, or else an appendix abscess may rupture into the bladder and hæmaturia or pyuria may follow.

Dr. Cuthbert Dukes.—Urinary infections are not such a common complication of diseases of the large intestine as might be expected. It is surprising to find how rarely the urine is infected in chronic ulcerative colitis, proctitis, diverticulitis and malignant disease. An intestinal disease, even when associated with extensive ulceration, does not appear to predispose to a *Bacillus coli* infection of the urine, unless some definite defect exists in the urinary tract.

The type of urinary infection which may follow surgical excision of the rectum is an interesting exemplification of this rule. When cancer of the rectum is first diagnosed, very few patients (less than 3%) have infected urine. For a few days after treatment by surgical excision of the rectum a patient cannot pass urine naturally, and during this period, or immediately afterwards, about 40% of men and 70% of women develop infections of the urinary tract with bacteria of the *Bacillus coli* group.

These infections are a disagreeable, and sometimes a dangerous, complication of rectal excision. It is natural to ask how they originate, and to what extent they are avoidable. The answers I shall try to give to these questions are based on the results of daily urine tests and clinical observation of more than a hundred cases. This experience has shown that there are three different types of infection and three main predisposing factors.
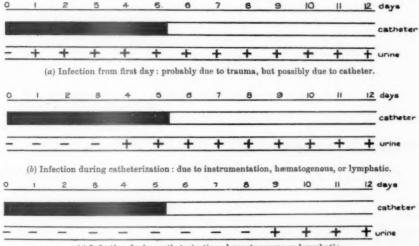
Types of infection.—When infection of the urine occurs after rectal excision the bacteria may reach the urinary tract (1) through trauma at operation, (2) through instrumentation to relieve retention, or (3) from the blood-stream. The source of infection may sometimes be decided by urine tests, for if the urine becomes infected from the first day the cause is probably trauma at operation, though possibly catheterization is responsible. On the other hand, when the urine has been clear for a day or two and then becomes infected during the period of catheterization, the cause is either instrumentation or hæmatogenous infection. Infection after cessation of catheterization is certainly hæmatogenous in origin (fig. 1).

The relative frequency of these different types of infection differs according to age and sex. In women, infection is almost invariably due to catheterization, a fact which is explained by the difficulty of clean instrumentation in bedridden women with an abdominal colostomy and a discharging operation wound over the sacrum. In men any of the three types of infection may occur. Operative trauma is most

commonly responsible in advanced ulcerating growths adherent to the prostate or seminal vesicles. In elderly men with residual urine, hæmatogenous infection often occurs after cessation of catheterization. The danger of infection by the catheter itself can be considerably reduced by the use of a retained catheter with an antiseptic seal (*see foot-note on p.* 147). This happens also to be the most convenient method of relieving retention, and the most comfortable for the patient during the incapable stage of convalescence. This catheter has been used for all the male patients referred to in this paper, and it may be noted in passing that in more than fifty cases the catheter has been tied in for periods of from two to five days without any infection of the bladder or kidneys resulting.

Bacteriology.—All patients with a tied-in catheter develop a staphylococcal or streptococcal urethritis, but this clears up in a few days and is not accompanied by any pus in the bladder urine. Post-operative cystitis, pyelitis, or pyelonephritis is always due to hæmolytic *Bacillus coli, Bacillus proteus* or closely related bacilli.

(a) Infection from first day : probably due to trauma, but possibly due to catheter.

(b) Infection during catheterization : due to instrumentation, hæmatogenous, or lymphatic.

(c) Infection during catheterization : hæmatogenous or lymphatic.

FIG. 1.—Types of urinary infection after excision of the rectum. (Clear urine − ; infected urine +.)

The usual sequence of events is a bacilluria alone for a few days, followed by the sudden onset of pyuria. The pus and bacteria continue for from three to six weeks, after which, in favourable cases, the pus diminishes or disappears ; the bacilluria, however, usually persists for a longer period.

Clinical evidences of infection.—Under other conditions the onset of these infections would probably cause symptoms to which the patient would draw attention, but after the operation of rectal excision and the necessary urinary instrumentation, the patient often makes no complaint during the early stages of a urinary infection. The disease is, of course, diagnosed by urine examination, but if the facilities for this are not available, an infection may be suspected whenever, after the subsistence of the slight febrile period which normally follows operation, a sharp rise of temperature occurs without obvious cause (figs. 2 and 3, p. 156).

Factors predisposing to infection.—When one reflects on the opportunities for the admission of bacteria to the urinary tract, which occur during and after
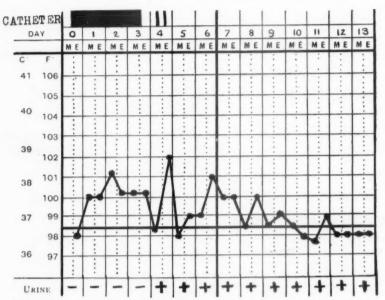
FIG. 2.—Cystitis following excision of the rectum.   Male, aged 52.   The infection of the urine on the morning of the fourth day was followed by a sharp rise of temperature.
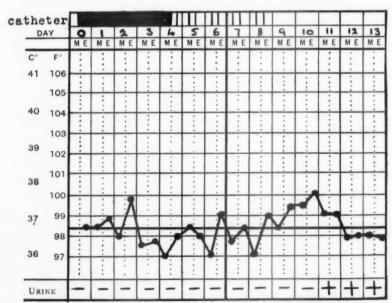

FIG. 3.—Cystitis following excision of the rectum.   Male, aged 38.   The infection of the urine on the eleventh day was preceded by fever.   There was an interval of two clear days between the cessation of catheterization and urinary infection.   Hæmatogenous infection

excision of the rectum, it is natural to suppose that potentially pathogenic bacteria reach the urinary organs of a larger number of patients than those who actually develop an infection. The reason why some patients succumb to infection whilst others escape, can be attributed to the influence of extrinsic factors predisposing to infection, of which the chief are : (1) the stage of the growth ; (2) the age of the patient ; and (3) the extent of damage to the nerve supply of the bladder.

(1) *Stage of the growth.*—Urinary infections are more frequent after operations for advanced carcinoma than after operations for early growths. In cases of cancer of the rectum in which there are no metastases in the lymphatic glands (A and B cases) urinary infection occurs after excision of the rectum in 30% of men and 60% of women. In late cases of cancer of the rectum with glandular metastases (C cases) urinary infections appear in 50% of men and ·75% of women. This greater liability to infection in cases of advanced carcinoma is not due to any difference in age—since the average age of these groups was approximately the same—but is to be attributed to a greater risk of injury to the urinary organs in advanced cancer cases and to weakened powers of resistance.
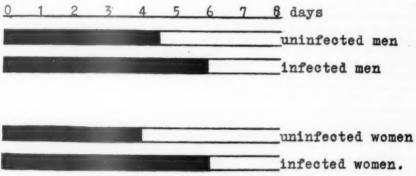

Fig. 4.—Retention of urine after excision of rectum.

(2) *Age of patient.*—In women age has not much influence on liability to urinary infection, but in men the probability of infection increases with advancing years. Thus, less than 30% of men under 50 years become infected, whereas of those over 60 more than half succumb to infection. A sharp rise in the percentage of infected men at the " prostate age " is particularly noticeable.

(3) *Damage to nerve supply of bladder.*—A comparison of the average period of urinary retention in infected and uninfected patients shows this period to be longer for the infected. Thus, for men who remained uninfected the average was 4·4 days, and for those who developed urinary infections 5·8 days. Women who remained free from infection passed urine naturally after an average period of 4 days, whereas 6 days was the average for women who became infected (fig. 4). These averages have been worked out from the records of 120 patients who succeeded in passing urine unaided within 21 days. They show that a definite correlation exists between the period of urinary retention and the likelihood of infection. Many of the factors responsible for post-operative retention are beyond the surgeon's control, but in some cases the inability to pass urine naturally appears to depend on injury to the bladder nerves. It would be interesting to know the average period of urinary retention following different types of operation.

Prevention.—Post-operative urinary infections are another example of the truth that prevention is easier than cure. They are more likely to be prevented if their

nature and cause are understood, and I hope that the foregoing description of the three types of infection and the three chief predisposing factors will contribute to this end.

Mr. E. T. C. Milligan : Perineal urinary fistulæ sometimes occur after excision of the rectum for malignant growths, and heal after some days without the cause and site being known.

To prevent damage to the urinary tract and to relieve anxiety when separating the rectum from the urethra, prostate, and bladder in front, I eagerly applied, as a preliminary to excision of the rectum, the technique of exposing the prostate from the perineum, as practised by Young, but with the invaluable modification of Lowsley, namely, a guarding and guiding finger in the rectum during the separation in the mid-line. That the risks of infection from this technique, properly carried out, are not increased—as some theorists might imagine—is amply proved, for it has now been practised for some years, and the last four cases of perineal excision have healed by primary union. It is a variation of the technique of perineal excision which could be recommended to the beginner, and certainly to the uro-proctologist, for it is on familiar anatomical ground common to both. It is a method of exposing the prostate which only a foolish urologist would neglect, for if he does, he will sooner or later require the kindly aid of a proctologist to remedy an accident to the rectum and—as the experience of Young, who omits the guarding finger in the rectum, shows—the repair of recto-vesical fistulæ is extraordinarily difficult, disappointing, and damaging to the reputation. Urologists know that the guiding and guarding finger in the rectum, in perineal exposure of the prostate for radium insertion, does not prevent the perineal wound from healing by first intention.

For injuries of the bladder with perineal fistula after perineal excision, an indwelling catheter with Duke's antiseptic block to ascending organisms is essential. When the leak does not cease, obstruction to micturition should at once be suspected, and the suspicion should be confirmed or eliminated by cystoscopic examination.

If the prostate is enlarged it should be removed as soon as the patient is fit to stand the procedure, for otherwise the fistula is not likely to heal.

At this juncture it is worth referring to a case which has some curious features and indicates the usual management in these conditions.

Three and a half years previously the patient had had perineal excision of the rectum, the seminal vesicles and portion of the bladder had been removed, whether purposely or by mistake is not known. The perineal wound healed, except for the urinary fistula. An indwelling catheter carried off most of the urine, but the perineal dressings were always moist. This pioneer of urethral drainage wore a tied-in urethral catheter cheerfully for three and a half years and carried out his duties of sanitary inspector. His kidneys were not infected. Cystoscopic examination revealed a small intravesical prostatic obstruction. The prostate was removed by suprapubic cystotomy.

In none of my cases of prostatectomy has the colostomy hindered the healing of the suprapubic wound, or the recovery of the patient, if both colostomy and suprapubic wound were managed according to established custom. The prostate and bladder, after removal of the rectum, the levator ani and the pelvic fascia, tilt backwards and downwards, helping to fill up the cavity remaining. By removing the prostatic enlargement a great deal is done towards curing the perineal urinary fistula, but in long-standing cases, such as in that quoted—with a rigid fibrous stoma in the bladder wall—something more is needed. Elaborate repair is almost impossible at the base of the bladder, now deep in the pelvis, so one must be content to loosen and dissect up the mucous membrane surrounding the opening, with long forceps and curved scissors, sufficiently to turn up a cuff of mucous membrane into the bladder cavity, producing, as it were, an entropion. Gentle stitching will hold the tissues in this inverted position for a few days, till they are set by inflammatory

stiffening products. The patient who is the text of these remarks is now, six years after the operation for carcinoma of the rectum, cured of the cancer, the prostate enlargement, and the perineal urinary fistula.

Treatment of patients suffering from carcinoma of the rectum and enlarged prostate.—From Dr. Dukes' remarks it can be appreciated that after excision of the rectum a patient runs all the risks of urinary infection, which may be trivial and transient, painful and prolonged, or occasionally virulent and lethal, wrecking a successful operation.

From experience it has been found that the risks of persisting post-operative retention of urine and grave urinary infection are greatly increased when a person suffering from enlarged prostate with residual urine first undergoes excision of the rectum. For this reason alone it is advisable to remove the enlarged prostate, before removing the rectum or, if there is danger because of impaired renal function, to drain the bladder by suprapubic tube. The suprapubic wound should not be allowed to heal; the bladder should be drained by indwelling suprapubic tube till the excision of the rectum is performed. Thus one can successfully control the temporary post-operative retention, and prevent unpleasant urinary complications.